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HARVARD SCHOOL
OF
PUBLIC HEALTH

Announcement of Courses and General Information

1971-72

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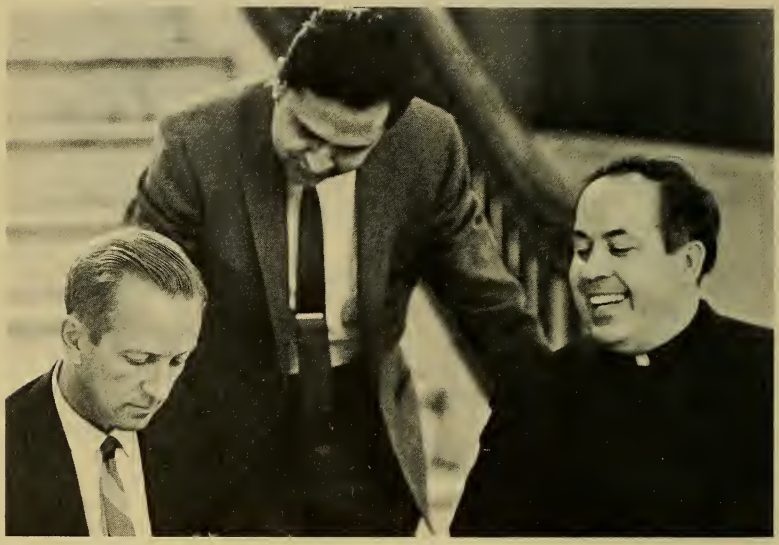

Graduate students from many parts of the world come to study in Harvard's School of Public Health. Physicians, engineers, physical scientists, social scientists, and other health specialists prepare here for careers of leadership in teaching, research and the administration of health services, both nationally and internationally.

The Harvard School of Public Health operates as an autonomous unit of Harvard University in close association with the Faculties of Arts and Sciences, Divinity, Government, Business Administration, Education, Law, Medicine and Dental Medicine.

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HEALTH SCIENCES LABORATORIES
665 Huntington Avenue, Boston

Building One (left) houses the Kresge Center for Environmental Health (Environmental Health Sciences and Physiology), the Departments of Biostatistics, Epidemiology, Microbiology, Nutrition, Population Sciences (including parts of the Center for Population Sciences), and Tropical Public Health. Building Two (right) houses the Department of Nutrition and part of the Department of Tropical Public Health. Building Three is under construction (to the left of Building One) and will be the Educational Facilities Building of the School.

ONE

INTRODUCTORY INFORMATION

ACADEMIC CALENDAR–1971-1972

***SEPTEMBER 13, MONDAY, 10 A.M.**	Opening session and registration for new International Students
***SEPTEMBER 15, WEDNESDAY, 2 P.M.**	Opening session and registration for new U.S. Students

The period between the opening sessions and September 22 will be devoted to orientation lectures, individual conferences with faculty members, and selection of courses of study.

***SEPTEMBER 20, MONDAY, 10 A.M.**	Opening session and registration for students enrolled in 1970–71.

FALL TERM, SEPTEMBER 22, 1971 THROUGH JANUARY 29, 1972

SEPTEMBER 22, WEDNESDAY	First Period Courses begin
OCTOBER 11, MONDAY	Columbus Day: a holiday
OCTOBER 25, MONDAY	Veterans' Day: a holiday
NOVEMBER 20, SATURDAY	First Period ends
NOVEMBER 22, MONDAY	Second Period Courses begin
NOVEMBER 25 and 26, THURSDAY and Friday	Thanksgiving Recess
DECEMBER 8, WEDNESDAY	Spring Term Orientation Day

Recess from Sunday, December 19, 1971 through January 2, 1972

JANUARY 29, SATURDAY	Second Period Courses end
JANUARY 31, MONDAY through FEBRUARY 5, SATURDAY	Directed reading period, supervised special studies or field observations

* All students are required to attend the opening session and to be present for the registration period.

SPRING TERM, FEBRUARY 7, 1972 THROUGH JUNE 15, 1972

FEBRUARY 7, MONDAY	Third Period Courses begin
FEBRUARY 21, MONDAY	Washington's Birthday: a holiday
APRIL 1, SATURDAY	Third Period ends

Recess from Sunday, April 2, 1972 through Sunday, April 9, 1972

APRIL 10, MONDAY	Fourth Period Courses begin
MAY 29, MONDAY	Memorial Day: a holiday
JUNE 3, SATURDAY	Fourth Period ends
JUNE 5, MONDAY through JUNE 14, WEDNESDAY	Post-class Period
JUNE 15, THURSDAY	Commencement

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The School and Its Facilities

The Harvard School of Public Health is primarily devoted to graduate education in public health and its aim is to provide opportunities for those who seek careers in one or more of the principal areas of public health activities — teaching, research, and the administration of health services, both nationally and internationally.

Public health evolved from the early combination of medical science and engineering for the control of environmental hazards. It has grown to embrace various facets of the biological, physical and social sciences as community aspects of health problems have become more complex and demanding. Public health now depends upon the skills and knowledge of members of several professions. The role of a graduate school of public health today is to prepare those who will be concerned with health problems which lie outside the scope of any single discipline, problems which can be solved best by the skillful cooperation of physicians, nurses, engineers, physical scientists, social scientists and other health specialists.

HISTORY OF THE SCHOOL

Activity in professional education in the field of public health had been steadily increasing in Harvard University over a period of more than two decades before the actual founding of the School, in 1922. The development was a gradual one, characterized by certain important steps, the first of which was the establishment in 1909 of the Department of Preventive Medicine and Hygiene in the Medical School — the first such department in the United States. The degree of Doctor of Public Health was first conferred in 1911. In this same year a Department of Sanitary Engineering was inaugurated in the Graduate School of Engineering. In 1913 the Department of Tropical Medicine, and in 1918 the Division of Industrial Hygiene, with clinical and laboratory facilities, were organized in the Harvard Medical School.

In 1913 the Harvard-Massachusetts Institute of Technology School for Health Officers was formed under the joint management of Harvard University and the Massachusetts Institute of Technology. This School operated until the fall of 1922, when it was superseded by the Harvard School of Public Health which was made possible by a generous endowment for this purpose from The Rockefeller Foundation.

When the School first opened, several departments were set up as joint departments with the Medical School, with shared facilities, faculty and budgets. This arrangement continued until 1946 when another grant from The Rockefeller Foundation provided additional space and facilities for the School of Public Health. At this time the School was separated administratively and financially from the Medical School and became an autonomous unit of Harvard University. It continues to cooperate with the Medical School in teaching and research, and has also developed close association with other schools of the University, particularly the Graduate Schools of Arts and Sciences, Government and Business Administration.

OBJECTIVES OF THE SCHOOL

The objectives of the School of Public Health are the advancement and dissemination of knowledge relating to human health and well-being. To fulfill these objectives the School provides instruction to graduate students and research fellows, conducts research, and participates in national and international health activities.

In its efforts to advance knowledge, the School is concerned with health problems of major importance to society, not only in the highly urbanized and technologically advanced regions, but also in the predominantly rural or economically disadvantaged areas of the world.

The educational program of the School provides advanced instruction in the community-oriented health sciences and in the techniques of administration for highly qualified young men and women who have potential for imaginative leadership.

In its involvement in the contemporary health problems of society, the School collaborates with community leaders in seeking

ways in which knowledge can be effectively used for the advancement of human health. The School is particularly concerned with the development of realistic social policies in relation to health problems and population growth. New developments in these fields may be reflected in elective courses designed to meet the special needs and interests of students at their request. Such courses are usually offered in the individual departments under the tutorial program.

DUAL ROLE OF THE SCHOOL

The School has the dual role of (1) a professional school that provides for the generalist a comprehensive broad program of basic knowledge in relevant health sciences and (2) a graduate school that provides advanced instruction and opportunities for independent study in depth for those students who seek to be-

come specialists in one of the public health disciplines. To fulfill these roles, two different degree programs are offered. One involves the professional degrees of Master and Doctor of Public Health with a wide range of required subjects. Candidates for these degrees must be graduates of approved schools of medicine, dentistry or veterinary medicine; in some cases, qualified individuals who hold doctoral degrees in the biological sciences may be admitted to the program.

The other program leads to the degrees of Master and Doctor of Science in a public health discipline, and provides the opportunity to concentrate intensively in an area of special interest. The backgrounds of the candidates for these degrees range across the physical, biological and social sciences — engineers, health educators, nurses, nutritionists, social workers and statisticians. Individuals with a doctoral degree in the medical or biological sciences may elect these programs if they prefer a specialized area of study.

THE LOCATION AND BUILDINGS

The twelve departments of the School of Public Health are housed in the Rotch Building at 55 Shattuck Street and the Health Sciences Laboratories at 665 Huntington Avenue, Boston. The administrative offices are in the Rotch Building. The School's buildings are adjacent to the Harvard Medical and Dental Schools, the Countway Library of Medicine, the Children's Medical Center, and the Peter Bent Brigham Hospital.

OTHER FACILITIES

The facilities of the hospitals and the adjacent institutions are available to qualified students of this School, and are used in connection with the teaching of various subjects. In addition, students enrolled at the School may take courses in other departments of Harvard University, such as in the social sciences, public administration, economics, statistics and medical sciences. Certain graduate courses at the Massachusetts Institute of Technology are also open to students of this School.

The Department of Sanitary Engineering of the School is also part of the Division of Engineering and Applied Physics of the Harvard Graduate School of Arts and Sciences in Cambridge. Qualified students may register for courses given by the Division of Engineering and Applied Physics.

The School maintains a close association with a wide variety of health, medical care, and welfare organizations in Massachusetts and elsewhere. These include health departments, hospital and other medical facilities, private health and welfare agencies, and community planning groups. These organizations provide opportunities for observation and special studies, and members of their staffs are available to assist in the School's educational program. Administrative methods at local levels may be studied at first hand in some of these agencies in the Greater Boston Area.

The State Laboratory Institute of the Massachusetts Department of Public Health is engaged in a program of general interest, attracting visitors and students from various parts of the United States and from foreign countries. It performs a wide variety of bacteriological, immunological and chemical procedures, and is engaged in several research programs. Its Superintendent is a member of the Faculty. This close contact with one of the country's outstanding laboratories provides excellent opportunities for qualified students who wish to obtain intensive experience in many types of laboratory methods of particular pertinence to public health.

The clinical and laboratory facilities of the Lemuel Shattuck Hospital are available to students of the School. This hospital was built by the Department of Public Health of the Commonwealth of Massachusetts for the treatment and rehabilitation of patients with chronic diseases. Since the average duration of hospitalization is usually longer than that in general hospitals, an opportunity is afforded to study chronic disease problems not encountered in general hospitals. The training program, consultant rounds and professional staff appointments are under the aegis of the Deans of Boston University, Harvard and Tufts University Medical Schools, as well as the Harvard School of Public Health. Research laboratories at the Shattuck Hospital are engaged in studies of arthritis, hematology,

pulmonary function, radioisotopes, cancer therapy and chronic renal and hepatic diseases.

LIBRARIES

The library needs of the School of Public Health are served principally by the Francis A. Countway Library of Medicine, which opened its doors to readers in June 1965. The Countway Library, located at 10 Shattuck Street, combines the resources and services of the Harvard Medical Library and the Boston Medical Library. Among libraries serving medical and health-related schools, it is the largest in the country. Its recorded holdings number 432,000 volumes, and it receives 5,400 periodicals annually. The Countway Library is open:

8:00 A.M. to 11:30 P.M. weekdays
9:00 A.M. to 5:00 P.M. Saturdays
2:00 P.M. to 11:30 P.M. Sundays

In addition to its holdings of current books and periodicals, the Countway Library has extensive collections of historical materials, dating from the 15th Century. Its History of Medicine Department provides modern facilities for the use of these books and other rarities.

For the convenience of the several departments of the School, collections of books and journals are maintained within those departments.

All members of the University may borrow from the College Library at Cambridge. Messenger service is provided daily between the College Library, various other Harvard University Libraries, and the Countway Library.

The Boston Public Library issues cards to permanent and to temporary residents of Boston. Other libraries of the Boston area, notably those of the Massachusetts Institute of Technology, add to the total book and periodical resources available to students.

Through the generosity of the Harvard School of Public Health, Class of 1966, a typewriter is available in the Countway Library for the use of students.

The Countway Library of Medicine Periodical Room

The librarian of the Countway Library is Harold J. Bloomquist, and Dr. Jean Mayer represents the School of Public Health on the Library Committee.

HENRY LEE SHATTUCK INTERNATIONAL HOUSE

The Henry Lee Shattuck International House is maintained by the Harvard School of Public Health on a nonprofit basis as a residence for its students and their families from the United States and abroad. Located within walking distance of the School at 199, 203 and 207 Park Drive, the House comprises sixty-one individual apartments of one to four rooms, each with its own kitchenette, bath and foyer. The nine two-bedroom and two three-bedroom apartments are reserved for families with two or more children. The apartments are furnished with basic items except for linens, blankets, and kitchen utensils and are leased for the ten-month period September 1 through June 30. Included in the monthly rent are hot water, heat, janitor service and all utilities except telephone.

In addition, the Shattuck International House provides a playroom and an outdoor playground suitable for small children, a laundry room, and a study room. There is also a modern Recreation Area for adults consisting of a library, music rooms, a large meeting room, and fully equipped kitchen. These facilities are available to all students enrolled at the School of Public Health. Here under the sponsorship of faculty and students are held informal gatherings and scheduled events, offering many opportunities for exchange of ideas and information about the culture, geography and social structure of the many countries represented in the House and the School.

The Shattuck International House was established in 1960 by the Faculty, alumni and friends of the School for students and their families, with the hope that it would serve as a dignified residence and a congenial center for recreational and cultural activities.

TWO

ADMISSION AND DEGREES

Application for Admission

Applicants must submit the following for consideration by the Committee on Admissions and Degrees: (1) completed application form; (2) transcripts of academic record at college, graduate school and/or professional school; (3) names of at least three people, well acquainted with the applicant's previous work, from whom the School may request letters of reference.

An application fee of $15, which is not refundable, is required for each formal application. A check drawn on a bank in the United States, a postal money order, or an international money order, payable to the Harvard School of Public Health, must accompany the application.

Applicants from countries in which the language of instruction is not English must satisfy the Committee as to their ability to speak, read, write and understand the English language competently. The applicant ought to have sufficient knowledge of English to enable him to understand lectures in English, to participate in seminar discussions and to write examinations. In the absence of sufficient evidence from the sponsoring agency and other sources, the School may request that the applicant take and pass satisfactorily the University of Michigan English Language Test. If, upon arrival at the School, a student's command of English is not found to be adequate, he may be required to take further instruction in English.

In addition to fulfilling the specific requirements for admission to a degree program, applicants must satisfy the Committee as to their ability to undertake advanced study at a graduate level. The final decision as to the admissibility of an applicant rests with the Committee on Admissions and Degrees.

Preference will be given to applicants under 40 years of age.

Applications for admission from members of minority groups are especially encouraged.

The School is unable to accept all who are eligible for admission.

Therefore, persons who wish to be considered for admission are urged to submit their applications by April 1st prior to the academic year in which they wish to enroll. However, applications which are completed by *April 30th*, will be considered, subject to availability of space.

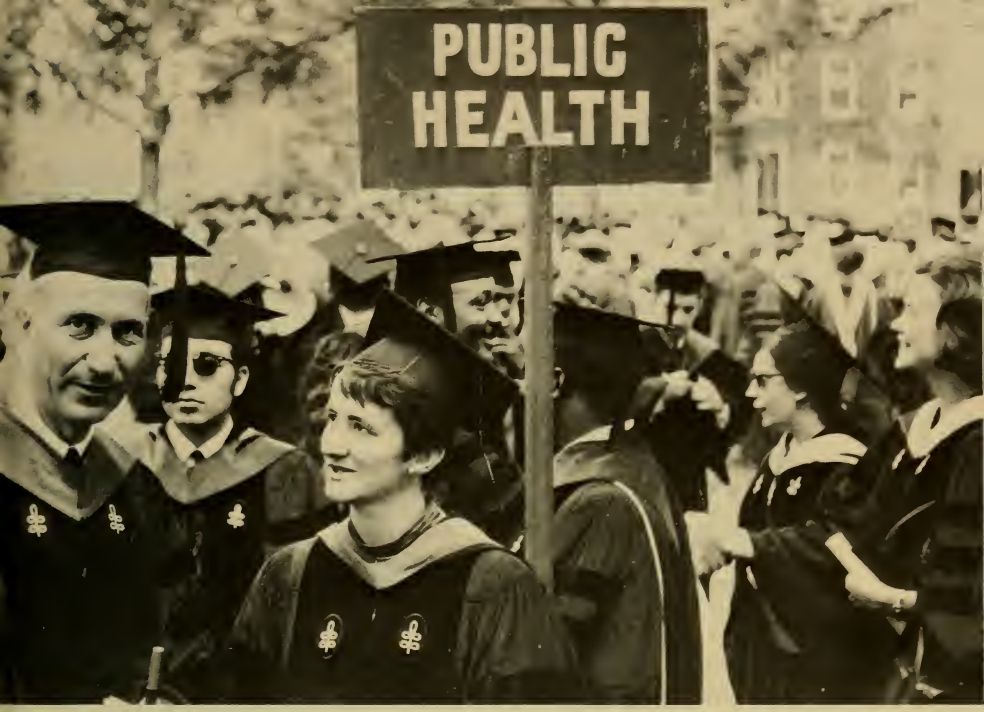
Admission of a candidate for one academic year does not automatically admit him in a subsequent year; re-application is considered on the same basis as a new application.

All inquiries and communications regarding admission should be addressed to the Director of Admissions, Harvard School of Public Health, 55 Shattuck Street, Boston, Massachusetts, 02115.

Living Expenses

Living costs in the Boston area are higher than in most areas from which students come. Therefore, the school has adopted the policy stated below in regard to applicants for admission from outside the United States.

An applicant whose financial support is not guaranteed by an official U. S. agency or foundation must submit evidence satisfactory to the School that he will have sufficient funds available in U. S. currency to enable him to pay his expenses during the academic year. The minimum amount needed by a single person, in addition to travel, is $5,900, to cover cost of tuition ($2,800) and living expenses of at least $350 a month for approximately nine months. If an applicant plans to bring his family, he must have at least $1,700 more for his wife and $800 for each dependent child, in addition to travel expense. Certification of adequate financial resources must be received by the School before the immigration form needed to obtain a visa to enter the U.S. can be issued to the student.



Courses of Study and Degrees

MASTER OF PUBLIC HEALTH DEGREE

Requirements for Admission

1. Applicants may be considered for admission as candidates for the Master of Public Health degree if they are graduates of approved schools of medicine or if they have similarly thorough preparation in the biological sciences.

2. Persons with these qualifications must satisfy the Committee on Admissions and Degrees as to their scholastic ability to study at a graduate level.

Requirements for the Degree

1. One academic year must be spent in residence at the University. The student must complete successfully a program of basic and elective courses to a minimum total of 40 credit units.

The first term of the Master of Public Health program empha-

sizes a core curriculum providing basic information in the sciences relevant to public health and an understanding of principles and methods. The second term is devoted largely to courses elected by the student in consultation with his Faculty adviser.

2. All candidates for the degree are required to take a *minimum* of 16 units from the following *Core Curriculum*:

Course	*Credit units*
Principles of Biostatistics (Biostatistics 101a,b)	3.5
Principles of Epidemiology (Epidemiology 201a,b)	2.5
*The Nature and Function of Health Care Delivery Systems (Health Services Administration 201a,b)	4
*Administration and Organization of Health Services (Health Services Administration 203a,b)	4
*Policy and Practices in Medical Care Organization (Health Services Administration 212c,d)	2
*Economic and Administrative Issues in Medical Care (Health Services Administration 295c,d)	3

*NOTE: *Credit units for only one of the above courses may be applied toward the minimum of 16 units from the core curriculum.*

Principles of Environmental Health (Environmental Health Interdepartmental 201a,201b)	4
Ecology and Epidemiology of Infectious Diseases (Microbiology and Tropical Public Health 201a,b)	4
Introduction to Behavioral Sciences (Behavioral Sciences 101a,b)	2
Public Health Nutrition (Nutrition 201a)	1
Population Growth and Fertility Control (Population Sciences 201a)	1
History and Philosophy of Public Health (Interdepartmental Course 201c)	1

3. The balance of the Master of Public Health program in the spring term is devoted to elective courses, seminars and tutorial work, chosen by the student on the basis of his field of interest.

These courses are described on pages 83–179. Certain courses in other graduate schools of Harvard University and in the Massachusetts Institute of Technology are open to full-time students in the Harvard School of Public Health.

4. No formal classes are scheduled during the one-week period between the Fall and Spring terms. This time is available to study data processing in the Department of Biostatistics or for supervised special studies or field observations in other Departments. All candidates for the Master of Public Health degree are required to register for work during this week in Biostatistics 213e (Introduction to Computing), or in Course 300e (Tutorial) or Course 330e (Field Study), in other Departments. Opportunities available are listed under the various Departments. One unit of credit will be given for satisfactory completion of the week's assignment.

MASTER OF SCIENCE

(With Designation of a Field of Concentration)

This degree is granted on fulfillment of a program of advanced work in one of the basic disciplines of public health. The courses taken *must form an integrated plan of study in one branch of knowledge and allied subjects.*

Requirements for Admission

1. Applicants may be considered for admission as candidates for the Master of Science degree, on the basis of a one-year or a two-year program, if they meet the requirements in one of the categories listed below.

2. Persons with these qualifications must satisfy the Committee on Admissions and Degrees and the department within which they choose to specialize as to their potentiality for successful study at a graduate level within the School.

One-year Program

1. Applicants who are graduates of approved schools of medicine or who have a thorough preparation of a similar nature in the biological sciences.

2. Applicants who have a doctoral degree from an approved school in a discipline related to public health.

3. Applicants in public health specialties (social workers, nurses, health educators, nutritionists) who have obtained a master's degree with honor grades in their special fields and have had at least two years' acceptable experience in a public health activity.

4. Applicants in industrial hygiene, air pollution control, radiological health and public health engineering who meet certain requirements with respect to academic background and experience. Normally this includes receipt of a bachelor's degree with honor grades (including adequate undergraduate training in physics, biology, chemistry and mathematics) supplemented by at least two years of relevant professional experience in the chosen field of specialization.

Two-year Program

Applicants with a bachelor's degree obtained with honors in the natural sciences who wish to specialize in one of the laboratory sciences or statistics.

Under certain circumstances, a year of graduate work in another approved institution may be accepted as the first year of this program.

Requirements for the Degree

1. The student must spend a minimum of one year in residence at the University and must complete successfully a program of at least 40 credit units. Candidates in the two-year program must obtain at least 80 credit units.

2. All candidates for the degree are required to take Biostatistics 101a,b and Epidemiology 201a,b, unless they can demonstrate equivalent preparation. Candidates who do not have a background in medicine or biology are advised to take Physiology 203a,b, or a course in general biology elsewhere. The remainder of the program is devoted to courses which may be prescribed by the department of concentration and to elective courses in the primary and related fields

of interest. These courses are described on pages 83–179. Courses offered by other Faculties of the University are also available.

3. No formal classes are scheduled during the one-week period between the Fall and Spring terms. This time is available to study data processing in the Department of Biostatistics and for supervised special studies or field observations. All candidates for the Master of Science degree are required to register for work during this week, under Biostatistics 213e (Introduction to Computing), or in Course 300e (Tutorial) or Course 330e (Field Study), given by their Department of concentration. Opportunities available are listed under the Departmental course offerings. One unit of credit is given for satisfactory completion of the week's assignment.

MASTER OF INDUSTRIAL HEALTH

A program of courses leading to a Master of Industrial Health degree is designed to meet the needs for postgraduate training in graduate training in the public health disciplines which are relevant to the development of preventive medical programs in industry. This degree program is usually taken as part of a two-year approved residency in occupational medicine.

Requirements for Admission

Candidates must be graduates of an approved school of medicine and must also satisfy the Committee on Admissions and Degrees as to their scholastic ability to study at a graduate level. Students from the United States must have completed an internship of at least twelve months in a hospital approved by the American Medical Association.

Requirements for the Degree

1. One academic year must be spent in residence at the University.
2. The student must complete successfully the required and elective courses to a minimum total of 40 credit units. All candidates for the degree are expected to take the following courses unless they can demonstrate equivalent preparation:

Course	*Credit units*
Principles of Biostatistics (Biostatistics 101a,b)	3.5
Principles of Epidemiology (Epidemiology 201a,b)	2.5
Principles of Environmental Health (Environmental Health Interdepartmental 201a,201b)	4
Radiation Protection (Environmental Health Sciences 271a,b)	5
Basic Problems in Occupational Health and Industrial Environments (Environmental Health Sciences 251c,d)	5
Total	20

In addition, the student may select courses from the general curriculum or do special work subject to approval of the Heads of the Departments of Environmental Health Sciences or Physiology.

3. No formal classes are scheduled during the one-week period between the Fall and Spring terms. This time is available to study data processing in the Department of Biostatistics or for supervised special studies or field observations. All candidates for the Master of Industrial Health degree are required to register for work during this week, under Biostatisitcs 213e (Introduction to Computing), or in Course 300e (Tutorial) or Course 330e (Field Study), given by their Department of concentration. Opportunities available are listed under the Departmental course offerings. One unit of credit will be given for satisfactory completion of the week's assignment.

DOCTOR OF PUBLIC HEALTH

For the degree of Doctor of Public Health the student must complete an approved program of independent and original investigation in a special field and must present the results of this research in an acceptable thesis.

Requirements for Admission

1. An applicant for admission to candidacy for this degree must be either (a) a graduate of an approved school of medicine, dental

medicine or veterinary medicine, or (b) the holder of another doctoral degree in one of the basic sciences related to public health.

2. The applicant must hold the degree of Master of Public Health or its equivalent from an approved institution and must have demonstrated potential ability to undertake original investigation in a special field.

3. Admission to doctoral candidacy is considered provisional until the candidate has passed the oral qualifying examination.

DOCTOR OF SCIENCE

(With Designation of a Field of Concentration)

This degree is granted on successful completion of a program of independent and original research in one of the basic disciplines of public health, and the presentation of this research in an acceptable thesis.

Requirements for Admission

Candidates for the degree of Doctor of Science must hold the degree of Master of Science or its equivalent and must indicate ability to undertake original investigation in a special field.

Admission to doctoral candidacy is considered provisional until the candidate has passed the oral qualifying examination.

REQUIREMENTS FOR DOCTORAL DEGREES

Residence

The student is required to complete a minimum of one academic year in residence. However, the required work and preparation of an acceptable thesis normally require at least two full years and frequently longer.

"Residence" requirements are fulfilled by payment of tuition and pursuit of an approved program. The first year is almost invariably in actual physical residence at the School. Subsequently, the thesis work may be continued at the School, or, in special circumstances, may be done *in absentia*. For thesis work done *in absentia*, the

Adviser and the appointed evaluators must meet with the candidate to appraise the thesis plan. Agreement must be reached and the Committee on Admissions and Degrees must be advised in writing prior to the departure of the student as to:

(a) The acceptability and feasibility of the proposed thesis plan
(b) The timing and scope of periodic written reports which will be required of the student
(c) Arrangements which have been or can be made for direct field supervision of the student
(d) The minimum period of time the student will spend at the School prior to submitting his thesis for appraisal by the Readers; a minimum of four months is recommended.

Doctoral Program Adviser

After the student enrolls in the School as a provisional doctoral candidate, a Doctoral Program Adviser is appointed by the Department of concentration. This Adviser keeps the student informed of all procedures and requirements for the degree, advises him about proper courses to be taken; decides, together with the Department, when the student is prepared to take the qualifying examination, and supervises the thesis work.

Foreign Language Requirement

The student is required to demonstrate a knowledge of one of the following languages in addition to English: French, German, Spanish, Russian, Chinese or Japanese. With permission of the Department, the student may make a request to the Committee on Admissions and Degrees for substitution of another language for one of those listed. The justification for such a request should be in terms of the scientific importance of the alternative language in the student's particular discipline.

Satisfaction of the language requirement is evaluated by the Committee on Admissions and Degrees. The examination is scheduled by the Registrar on request of the student. The student should be urged to satisfy the requirement as soon as possible, and not

later than two years after registration as a provisional doctoral candidate.

Qualifying Examination

The qualifying examination for admission to full doctoral candidacy consists of Part A and Part B.

Part A is administered by the Department of concentration, and consists of a thorough examination in the field of concentration and closely related areas. As many of the Departmental Faculty as possible should be involved in this examination. The examination may be written, oral, or both — at the discretion of the Department. On satisfactory completion of this part of the examination, the candidate is eligible to take Part B.

Management of Part B is the responsibility of the Committee on Admissions and Degrees. It is an oral examination in the field of concentration and at least two other relevant fields. In the field of concentration the examination focuses on the candidate's imaginative use of principles and ability to apply his knowledge, rather than his basic background of knowledge which has already been tested in Part A. The other fields of examination need not necessarily be related to the student's thesis topic; they are selected by the Department of concentration with approval of the Committee.

Both parts of the qualifying examination should normally be completed within one year of registration as a provisional doctoral candidate. Part A is scheduled by the Department and Part B by the Committee on Admissions and Degrees. Part B of the examination is open to all Faculty members; however, decision as to the outcome of the examination rests solely with the appointed examiners. The decision may be (a) pass, (b) general failure — requiring complete re-examination, or (c) specific failure — requiring re-examination only in the specified subject. Permission for re-examination rests with the Committee on Admissions and Degress, on the recommendation of the examiners.

Evaluation of Candidate's Progress

After the candidate has passed the qualifying examination, two

Faculty members are appointed to aid the Adviser in the periodic evaluation of the student's progress.

Form of Thesis

The thesis should consist of one or more manuscripts suitable for publication in a scientific medium appropriate to the candidate's field. If the work is published prior to submission of the thesis, copies of the publication may be submitted in lieu of manuscript. If not included in these documents, there should be added an introduction describing the historical setting and objectives of the work and a concise discussion that would provide an overall evaluation of its significance. Technical appendices should be added where necessary to demonstrate the full development of the thesis material.

Papers published under joint authorship are acceptable provided that the candidate has contributed a major part to the investigations. He is expected to be senior author on at least one of the papers. In the case of manuscripts published under joint authorship, the co-authors or the Adviser may be consulted by the Readers or the Committee on Admissions and Degrees to clarify the nature and extent of the candidate's contribution.

In addition to evaluating the quality and significance of the work, those responsible for accepting the thesis (the Department and the Readers) may determine whether the format is suitable for publication in a scientific medium appropriate to the candidate's field.

Evaluation of Thesis

The thesis must first be accepted by the Department of concentration. When it is, three unbound copies should be deposited in the Registrar's Office. On request of the Department, the Committee on Admissions and Degrees will appoint three or more Readers. When the Readers have individually evaluated the thesis, they will meet, together with one or more members of the Committee, and make a joint recommendation regarding acceptance of the thesis. If the thesis is accepted, the Committee on Admissions and Degrees may then recommend the candidate to the Faculty for the degree. The degree is voted by the Faculty at its special midyear or June meeting.

The Readers, as individuals or at their meeting, may call on the student for clarification, augmentation or defense of material presented in the thesis.

The unbound copies of the thesis must be in the Registrar's Office before *January first*, for degrees to be awarded at mid-year, and *before April fifteenth* for degrees to be awarded in June. In order to meet these deadlines, the candidate should submit the completed thesis to his Department at least two weeks in advance of these dates.

An acceptable thesis must be submitted within 5 years of the date of registration as a provisional doctoral candidate.

Final Seminar

There is no formal public thesis defense. However, after acceptance of the thesis by the Committee of Readers, the Department of concentration is responsible for the arrangement of a seminar at which the candidate will present and discuss his thesis work. These seminars are announced throughout the School, and are open to Faculty, research staff and students.

Credit Assignment

Credit units are assigned on the basis of the total amount of time required by a course, both in class and outside of class. Twenty credit units constitute a full program for one term.

Grading System

All courses are graded as "Satisfactory" or "Unsatisfactory." *Satisfactory* indicates performance of sufficiently high quality for credit to be assigned. A grade of *Unsatisfactory* means that no credit is given for the course. If a student is graded as *Unsatisfactory*, the following procedure is to be followed:

(a) *Unsatisfactory* in courses required by the Faculty and the Department of concentration:*

The Committee on Admissions and Degrees, in consultation with the Instructor and the Faculty Adviser, decides whether or not the student may be given a re-examination;

(b) *Unsatisfactory* in courses not required for a particular degree:

No re-examination is given if the student has enough credits for the degree. A re-examination may be given, as under (a) above, if credit is needed for the degree. This decision must be made within eight weeks after the end of the course.

Instructors are offered the opportunity to indicate those students who are doing outstanding work in their courses. Since this is not a part of the standard grading system it does not appear on the student's transcript but is included in his file.

* A Department may require specific courses for students in a Master of Science, Master of Industrial Health, or doctoral program in addition to those required by the School for the particular degree. Such courses would be classified as "required" courses.

Residency Programs

The School offers approved residency training leading to certification by the American Board of Preventive Medicine in the following areas:

Occupational Medicine

General Preventive Medicine, in the specialty areas of
- Epidemiology
- International Health
- Health Services Administration

Residency programs are three years in length and consist of one or two years of study leading to the graduate degree, Master of Public Health, or Master of Science, and one or two years of more advanced work including supervised experience which may or may not be part of a doctoral program. The third year may be devoted to training in an approved industry, organization, or institution consistent with the specialty area.

Further details on the residency programs, including availability of financial support, can be obtained through the Director of Admissions.

Special Students

Subject to availability of space, the School may accept a few students, on a full-time or a part-time basis, who are not degree candidates, but who are interested in taking one or more courses in a special field. Procedures and requirements for the admission of such students are the same as for degree candidates. Special students who later wish to be admitted to degree candidacy will be considered on the same basis as other applicants for admission. Admission as a special student carries with it no commitment to accept the applicant as a degree candidate.

Degrees in Engineering

Graduates of engineering colleges or scientific schools of recognized standing who are interested in environmental engineering may be admitted to the Division of Engineering and Applied Physics of the Graduate School of Arts and Sciences as candidates for the degree of Master of Science or Doctor of Philosophy. They may elect appropriate courses in the School of Public Health as a part of the program for these degrees.

For further information write to the Committee on Admissions, Graduate School of Arts and Sciences, Holyoke Center, 75 Mt. Auburn Street, Cambridge, Massachusetts, 02138.

THREE

CENTERS

The Kresge Center for Environmental Health

James L. Whittenberger, S.B., M.D., A.M. (hon.), Director
Dade W. Moeller, S.B., S.M., Ph.D., A.M. (hon.), Associate Director

This Center includes the Departments of Physiology, Sanitary Engineering, and Environmental Health Sciences, as well as a subunit specializing in problems of aerospace health and safety. The Center serves today as a focus for environmental health activities within the School of Public Health. It also represents Harvard University on the New England Consortium on Air Pollution and conducts environmental health teaching and research activities with other components within both Harvard University and the Massachusetts Institute of Technology. Such projects include the presentation of undergraduate courses in environmental health to students in Harvard and Radcliffe Colleges, and the presentation of joint courses and seminars with the Division of Engineering and Applied Physics, Faculty of Arts and Sciences.

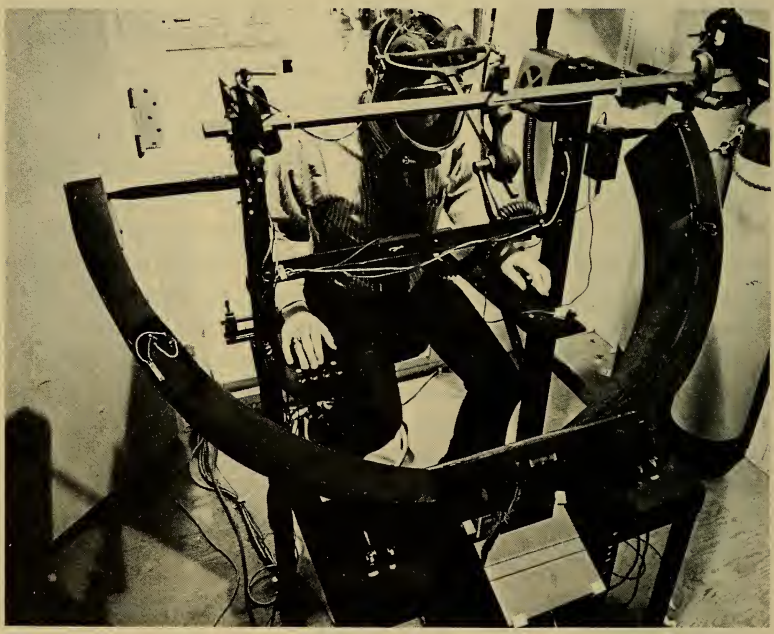
Full-time Faculty within the Center includes physicians, engineers, physiologists, psychologists, mathematicians, toxicologists, chemists, physicists, meteorologists and other professionals. This diversity enables the staff to deal effectively with environmental problems which require a multidisciplinary approach. The research budget of the Center exceeds one million dollars annually. Further details on the nature of research programs currently underway may be found in the introductory portions of the Departmental writeups found elsewhere in this catalogue.

Specific subject categories in which the Center conducts research and training include:

1. Aerospace Health and Safety
2. Air Pollution Effects and Control
3. Environmental Physiology
4. Environmental Toxicology

5. Human Factors — Accident Prevention
6. Industrial Hygiene
7. Occupational Medicine
8. Radiological Health
9. Respiratory Physiology
10. Sanitary Engineering

Degree programs available within the above areas include the Master of Science, Master of Industrial Health, Doctor of Science and Doctor of Public Health. Formal requirements for each of these degrees are outlined in other sections of the catalogue. Students interested in any of the above areas ordinarily enroll in the School of Public Health. Students whose primary interest is in problems of water quality and water resources generally enroll in



Apparatus, simulating high altitude, for studying human performance under low oxygen.

the Division of Engineering and Applied Physics of the Graduate School of Arts and Sciences.

Applicants desiring further details on any of these programs are encouraged to write to the Director of Admissions, the Head of the appropriate Department, or to the Director of the Kresge Center.

Center for the Prevention of Infectious Diseases

Thomas H. Weller, A.B., S.M., M.D., LL.D., Director
Roger Loyd Nichols, A.B., M.D., A.M. (hon.) Associate Director

The Center for the Prevention of Infectious Diseases is comprised of the Departments of Microbiology and of Tropical Public Health. Working in close collaboration, the staffs of the two Departments are concerned with the broad spectrum of agents, i.e., viral, rickettsial, bacterial, mycotic, protozoal, and helminthic entities, that parasitize man and with their relevant arthropod and molluscan vectors.

On a global basis the infectious diseases remain a primary cause of mortality. In the developed areas of the world, morbidity attributable to infectious diseases persists as a major impediment to the enjoyment of complete health. An increasing number of chronic degenerative diseases are recognized as stemming from the insults of prior-infectious processes. In many societies, acceptance of the concept of population control awaits containment of undue mortality induced by the infectious diseases and the consequent assurance that children who are born will have a reasonable prospect of achieving maturity. Considerations such as the foregoing emphasize the continuing need for the public health expert to possess knowledge of the rapidly changing technology of the control of infectious diseases, as well as a basic knowledge concerning the attributes and epidemiologic characteristics of the responsible agents.

The Faculty of the Center for the Prevention of Infectious Diseases operates in close collaboration to discharge a common responsibility for multidisciplinary instruction in the various facets of diseases of infectious etiology. The formal course offerings of the two Departments are designed and scheduled to permit the acquisition of a broad basic knowledge of infectious diseases as well as an introduction to specialized subject areas. For advanced

qualified students, concentration in specific areas with participation in collaborative or individual research is encouraged both at the pre-doctoral and the post-doctoral levels. The wide variety of current research projects in the Center permits acquisition of experience both at home and abroad, in the laboratory or in the field. Training grant funds are available for the support of qualified individuals specifically interested in public health bacteriology, rickettsiology, virology, mycology, parasitology, and tropical medicine.

Center for Population Studies

Roger Revelle, A.B., Ph.D., S.D. (hon.), A.M. (hon.), L.H.D., LL.D., Richard Saltonstall Professor of Population Policy and Director of the Center
John C. Snyder, A.B., M.D., LL.D., Professor of Population and Public Health and Medical Director of the Center.

Members of the Center for Population Studies who are also members of the Department of Population Sciences are listed under the description of the Department on page 161. Other Members of the Center are:

Russell G. Davis, A.B., ED.M., ED.D., Member of the Center for Population Studies; *Professor of Education and Development, Harvard Graduate School of Education*

Robert Dorfman, A.B., A.M., PH.D., A.M. (hon.), Member of the Center for Population Studies; *Professor of Economics, Department of Economics, Harvard University, Member of the Faculty of the School of Government*

Gino Germani, LIC-EN-PHIL, Member of the Center for Population Studies; *Monroe Gutman Professor of Latin American Affairs, Department of Social Relations, Harvard University*

Roy O. Greep, S.B., S.M., PH.D., A.M. (hon.), S.D. (hon.), John Rock Professor of Population Studies; *Director of the Laboratory of Human Reproduction and Reproductive Biology, Harvard Medical School*

Alexander D. Langmuir, A.B., M.D., M.P.H., Member of the Center for Population Studies; *Visiting Professor of Epidemiology, Harvard Medical School*

Harvey Leibenstein, S.B., A.M., PH.D., Member of the Center for Population Studies; *Andelot Professor of Economics and Population, Department of Economics, Harvard University*

Jean Mayer, B.A., B.SC., M.SC., PH.D., D.SC., A.M. (hon.), M.D. (hon.), Member of the Center for Population Studies; Professor of Nutrition and Lecturer on the History of Public Health

Ralph B. Potter, Jr., A.B., B.D., TH.D., Member of the Center for Population Studies; *Professor of Social Ethics, Harvard Divinity School*

Janet W. McArthur, A.B., M.D., Member of the Center for Population Studies; *Associate Professor of Obstetrics and Gynecology, Harvard Medical School*

PETER P. ROGERS, B.ENG., S.M., PH.D., Research Associate in Population Studies, *Associate Professor of Environmental Engineering, Division of Engineering and Applied Physics, Harvard University, Associate Professor of City Planning, Graduate School of Design*

ALBERT DAMON, A.B., PH.D., M.D., Member of the Center for Population Studies; *Senior Research Associate in Medical Anthropology, Peabody Museum, Lecturer on Anthropology, Harvard University*

MOHIUDDIN ALAMGIR, B.A., A.M., Research Associate in Population Studies

*CARL J. BAJEMA, S.B., A.M., PH.D., Research Associate in Population Studies; *Associate Professor of Sociology, Grand Valley State College, Michigan*

REZAUL K. BHUIYA, B.S., M.S., PH.D., Research Associate in Population Studies

*ROSE E. FRISCH, A.B., A.M., PH.D., Research Associate in Population Studies

HELEN GIDEON, M.B.,B.S., M.P.H., Research Associate in Population Studies

THOMAS MADDOCK III, S.B., S.M., PHD., Research Associate in Population Studies; *Hydraulic Engineer, U.S. Geological Survey, Alexandria, Virginia*

*DONELLA H. MEADOWS, A.B., PH.D., Research Associate in Population Studies

*MARIA L. MILANESI, M.D., Research Associate in Population Studies

DOUGLAS V. SMITH, S.B., S.M., A.M., PH.D., Research Associate in Population Studies

RICHARD D. TABORS, A.B., M.S.S., PH.D., Research Associate in Population Studies

*LOUIS S. GREENBAUM, A.B., A.M., PH.D., Consultant on Historical Population Studies; *Professor of History, University of Massachusetts, Amherst*

PAULINE S. WYCKOFF, A.B., Executive Secretary of the Center for Population Studies and Administrative Assistant to the Dean

WILMA E. WINTERS, S.B. IN ED., A.M., S.M., Librarian of the Center for Population Studies

The Center for Population Studies was established in 1964 under the leadership of the School of Public Health as a University-wide Center to help scholars and scientists in different fields join in a common attack on human population problems. The Members of the Center are concerned with teaching and research on the history, dynamics, and means of control of human population changes; the physiology of reproduction; the psychology and sociology of human fertility; interactions between resource development and population growth; questions of economics, health, nutrition, education, and moral values related to population problems; and the physical and social environments of human populations.

A Faculty Advisory Committee guides the operation and development of the Center. Seven of the Faculties of Harvard University are represented on this Committee: Arts and Sciences, Design, Divinity, Education, Medicine, Government, and Public Health. The Faculty of the Center includes members of the Departments of Anthropology, Economics, and Sociology, the Division of Engineering and Applied Physics, and the Schools of Public Health, Education, Medicine, and Divinity. Two headquarters are maintained, one in Boston in the School of Public Health, and one in Cambridge.

In the School of Public Health, the Department of Population Sciences, as an integral part of the Center for Population Studies, conducts a program of research and teaching on public health aspects of population problems. The Department welcomes qualified candidates for the various degrees offered by the School of Public Health who wish to concentrate on these problems. Elsewhere in the University, courses and seminars open to all qualified students are given by Members of the Center in the Departments of Economics, Sociology and General Education, in the Medical School, and the Divinity School.

At present, the Center is supporting pre- and post-doctoral research in demography, public health and fertility control, human reproductive physiology, religious attitudes toward fertility control, relations between population growth and economic and social development, and the sociological problems related to changes in human fertility patterns. Several broad research projects are in progress, both in the United States and overseas, and these provide further opportunities for graduate, post-doctoral, and faculty research.

Center for Community Health and Medical Care

Paul M. Densen, S.D., Director

The Harvard Medical School and School of Public Health established the Center for Community Health and Medical Care to serve as a University-wide focus of research and development of new educational approaches relevant to the organization and delivery of health services. The widening gap between growth of knowledge in the health sciences and capabilities of the system for delivering health services to the American people has become a matter of national concern. The Center is an expression of Harvard's determination to contribute to the nation's effort to facilitate and improve the application of the biomedical sciences toward the improvement of health of the peoples of this country and other countries of the world.

The Director, together with the Dean and the Associate Dean for Hospital Programs of the Medical School, and the Dean and Associate Dean for Community Affairs of the School of Public Health constitute the executive committee of the Center. Members of the Center are drawn from all Faculties of the University in which there is an active interest in health and health care services.

The interdisciplinary staff and faculty members of the Center are concerned with the design of experimental programs as well as the study of existing arrangements, mechanisms, organizations, institutions and related personnel involved in health care.

The Program of the Center includes:

1. Research in the organization and delivery of health services; and
2. Fellowship programs in medicine and public health designed to prepare professionals with the capabilities to design, plan,

manage and evaluate the instrumentalities and the systems for the delivery of health services.

By its involvement of several Faculties of the University and by its programs for young physicians and other professionals, the Center provides a focus for the health activities of Harvard which are broadly directed toward the improvement of health services and medical care.

<< Presidents Conant (left), Bok, and Pusey in the academic procession on Commencement Day 1971.

FOUR

DEPARTMENTS AND CONTENT OF COURSES

Course Numbering

100–199	Undergraduate and Graduate Courses
200–299	Primarily Graduate Courses
300–399	Graduate Courses of Reading and Research

Interdepartmental Courses

Interdepartmental Course 201c. History and Philosophy of Public Health

Lectures. *One two-hour session each week, third period.* Dr. Mayer.

Credit 1 unit.

Recommended as part of basic core curriculum for Master of Public Health candidates.

The course has two major purposes: to help the student of public health gain a picture of the development of his profession, and to use selected historical situations to illustrate how scientific knowledge has interacted in the past with political structure, economic status and cultural attitudes in the determination of the health goals of various societies and the execution of programs. In this light, the development of the science and practice of medicine, sanitary engineering and demography in Ancient Egypt, Greece and Alexandria, Rome, the Arab and European Middle Ages and the Renaissance is broadly sketched. The birth of the concept of a National Health Policy is traced to the Ages of Mercantilism and Enlightenment. The Sanitary Movement and its relation to the Industrial Revolution is examined with particular reference to Britain, France and the United States. The growth of modern concerns with pollution, food contaminants, medical insurance and medical outreach is traced back to specific historical movements. The extent to which present trends in health in developing countries differ from or resemble past developments in industrial countries will be discussed.

Interdepartmental Course 202c,d. Teaching of Community Medicine and Public Health

Seminars. *Two two-hour sessions each week, third and fourth periods.* Dr. Segall.

Credit 4 units.

This course is designed for students who are preparing for careers as teachers of community medicine and public health or as administrators of teaching programs. Educational objectives as well as methods for implementing and evaluating instructional programs are stressed. Students have an opportunity to study selected educational methods in depth, including: simulations, self-instruction, the lecture, and small group teaching. Each student designs curriculum in an area of interest.

Enrollment is subject to the approval of the Instructor.

Interdepartmental Courses 203–207c,d. Seminars on Educational Policy

Seminars. *One two-hour session each week, third and fourth periods; time to be arranged.* Dr. Segall.

Credit 2 units. Additional credits can be arranged for those desiring extra instruction.

These seminars are designed for students who plan to teach in a variety of educational settings. Each of the five seminars offered is concerned with policy issues which arise in the development of training programs in community medicine and public health for a specific category of health manpower. Through individual instruction and seminar discussions, students will assess the impact of professional expectations, social needs, and institutional constraints on the selection of educational goals. The process of curriculum development will be examined in the light of overall health priorities, the nature of the health care delivery system, the role of the practitioner in relationship to other categories of health manpower, innovations in instructional technology and historical determinants of current educational practices.

203 *Teaching Community Medicine in the United States*, Dr. Kennedy and Dr. Mack.

This seminar is designed primarily for students who plan to teach in medical schools or in governmental agencies in the United States. It will include an overview of American medical education with particular reference to innovative programs in the teaching of community medicine.

204 *Teaching Preventive and Social Medicine in the Developing Countries*, Dr. Koch-Weser and Dr. Morrow.

This seminar is intended for those students who plan to teach in schools of medicine in the developing countries or who will work in government-sponsored educational programs. Examples will be drawn from representative curricula in the developing countries.

205 *Teaching Community Dentistry*, Dr. Glass.

This seminar is offered for students who plan to teach in schools of dentistry. It will focus on those curricular issues particularly relevant to the training of dental students in fields related to public health.

206 *Teaching Allied Health Professionals*, Dr. Wilson and Dr. Yankauer.

This seminar is designed for students who intend to teach or administer programs for allied health professionals. Both traditional and innovative approaches will be discussed, including programs for the new cadres of health professionals. Examples include joint training and 'new careers' programs.

207 *Teaching in Graduate Public Health Programs*, Dr. Dawson and Dr. Dwyer.

This seminar is intended for students who are interested in teaching in schools of public health or in graduate level community health programs. Current curricula will be analyzed in terms of their appropriateness for preparing public health professionals for current and future responsibilities.

Interdepartmental Course 208c,d. Human Rights in Health

Lectures. *One two-hour session and one one-hour session each week, third and fourth periods.* Dr. Curran.

Credit 3 units.

This course includes a comprehensive examination of basic human, personal rights as they bear upon health programs in the United States, other countries, and on an international basis. The development of rights will be considered from the viewpoint of the legal status of persons through the human life span. Among the values examined will be the right to medical care, the right to a healthy environment, equality among people, the rights of women, the rights of children, consumer's rights, the right to privacy, and the rights of subjects in medical research. Consideration will be given to the problems of balancing personal rights against community benefits and community protection.

Problems of human and community rights will be considered in the context of specific health programs such as population control, narcotic and other dangerous drug controls, immunization and nutrition programs among large populations, compulsory hospitalization, and medical care delivery to minority groups.

National and international laws, documents and charters will be examined such as the United Nations Declaration on Human Rights, Rights of Children, International Sanitary Regulations, U.S. Constitutional Bill of Rights, and decisions on birth control, abortion, quarantine, privacy, drug addiction, etc.

Interdepartmental Course 300a,b,c,d. Teaching of Community Medicine and Public Health

Time and credit to be arranged. Dr. Segall.

An opportunity for tutorial work in curriculum design, development of methods of instruction and evaluation and other areas related to teaching community medicine and public health will be given interested students.

Department of Behavioral Sciences

Alexander H. Leighton, A.B., A.M., M.D., Professor of Social Psychiatry *and* Head of the Department

Dana L. Farnsworth, A.B., S.B., M.D., S.D. (hon.), L.H.D., LL.D., Henry K. Oliver Professor of Hygiene Emeritus (1971); Consultant on Psychiatry

*Charles M. J. Mertens de Wilmars, M.D., Lic. en psych., *Visiting Professor of Psychiatry; Professor of Medical Psychology, Faculty of Medicine, Catholic University of Louvain, Belgium*

Morton Beiser, M.D., Associate Professor of Social Psychiatry

Robert C. Benfari, A.B., A.M., Ph.D., S.M. in Hyg., Associate Professor of Psychology

Jane M. Murphy, A.B., Ph.D., Associate Professor of Anthropology

*David S. Shapiro, A.B., Ph.D., Lecturer on Social Psychiatry

*Carlos E. Climent, B.S., M.D., S.M. in Beh. S. & Epid., Instructor in Social Psychiatry; *Clinical Instructor in Psychiatry, Harvard Medical School*

*Alice L. Nangeroni, A.B., Research Associate in Behavioral Sciences; *Assistant to the Chairman, Department of Sociology, Cornell University*

Victor G. Cardoza, Field Project Administrator

*Jean-Noel Fortin, B.A., M.A., M.D., Consultant on Psychiatry; *Associate Professor of Psychiatry, University of Montreal*

*John S. Harding, A.B., A.M., Ph.D., Research Consultant on Psychology; *Professor, Department of Child Development and Family Relationships, Cornell University*

*Herbert O. Levine, M.D., Consultant on Psychiatry; *Clinical Assistant in Psychiatry, Harvard Medical School*

Melvin J. Krant, A.B., M.D., M.I.H., Research Fellow in Behavioral Sciences

Alexander E. MacLeod, B.D.S., D.D.S., M.A., S.M. in Beh. S., Teaching Fellow in Behavioral Sciences

Mary C. Adams, S.B., Administrative Assistant in Behavioral Sciences

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Edward J. Rolde, A.B., M.D., S.M. in Hyg., *Instructor in Psychiatry, Harvard Medical School*

The Department of Behavioral Sciences has a primary concern with the

* Part-time in the School of Public Health.

relationship of social and cultural factors to mental health and mental illness. Allied to this is an interest in the way social, cultural, and psychological factors affect the development and effectiveness of planned changes, particularly those involving public health programs.

Students have the opportunity to study psychiatric epidemiology, cross-cultural psychiatry, the characteristics of community services, medical sociology, and the role of cultural factors in health and disease. Because of its crucial importance to all aspects of public health, special attention is given to studying factors which affect program acceptance — why people accept or reject certain public health programs. Throughout the curriculum considerable emphasis is given to research and research methodology.

The Department's teaching plan is therefore geared both to the student who has a social science background and wishes to know more about mental health and illness, and to the student who has a clinical orientation and wishes to know more about the social, cultural, and psychological influences which shape the human community. To supplement Departmental and School resources to achieve this end, the student may take additional courses in other parts of Harvard University such as the Department of Psychiatry and the Department of Social Relations.

The current research of the Department is focused on longitudinal community studies of mental health and mental illness, comparative psychiatric epidemiology, the effects of social and cultural change, the adjustment and adaptive processes of individuals and families after severe illness, the evaluation of psychiatric preventive measures, and the effects of intervention. In addition to being concerned with causal relationships and the building of significant theory, Departmental members give major weight to the development of methods, the revision of concepts, and the testing of reliability and validity of mental health survey techniques. Doctoral candidates and fellows have the opportunity of sharing in these studies as team members, and also of selecting a segment for independent investigation.

Behavioral Sciences 101a,b. Introduction to Behavioral Sciences

Lectures. *One two-hour session each week, first and second periods.* Dr. LEIGHTON and Staff of the Department.

Credit 2 units.

Recommended as part of the core curriculum for Master of Public Health candidates.

The behavioral sciences, encompassing such disciplines as sociology, anthropology, psychology, and psychiatry, are highly relevant to many areas of public health practice, programing, and research. It is obviously impossible to present even a cursory review of all pertinent behavioral science subject matter; therefore, material for this course is selected on the basis of its relevance to public health in general. The course also provides the

required background for advanced courses given by the Departments of Behavioral Sciences, Health Services Administration, and Maternal and Child Health. The approach is illustrative rather than encyclopedic and covers a range of subjects — from such matters as brain function, learning and perception, to the behavior of human groups.

The first of three aims of this course is to survey the present state of social science concepts, theories and methods of research. The second aim is to highlight information, theories, and methods of practical application of the behavioral sciences that will be of use to the policy-maker, the planner, and the teacher. This means attention to the patterning and functioning of health agencies, the factors that influence the acceptance or rejection of public health programs, and the special issues characteristic of poverty and situations of cultural contrast and change. The third area of emphasis is social psychiatry. This new and expanding public health field is examined with particular reference to the prevalence of psychiatric disorders, their social causes, and preventive measures.

Behavioral Sciences 202a. Advanced Topics in the Behavioral Sciences: Personality

Seminars. *One two-hour session each week, first period.* Dr. Beiser and Dr. Benfari.

Credit 2 units.

This seminar involves comparative analysis of selected theories and concepts of personality. The emphasis is on historical and current issues in the field of personality theory, and models of both normal and abnormal functioning are given attention. The aim of the course is to apply principles of personality to mental health research and public health programs. The course is especially appropriate for students planning a career in social psychiatry.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 202b. Advanced Topics in the Behavioral Sciences: Social Processes

Seminars. *One two-hour session each week, second period.* Dr. Murphy.

Credit 2 units.

This seminar deals with various ways of conceptualizing and measuring social processes for relevance to public health with particular reference to mental health and mental illness. This includes studies of community integration, social class, and poverty. In addition, attention is given to the family, anomie, social networks, cultural values, and behavior settings. It is designed especially for students who plan to work in fields such as social psychiatry, medical anthropology, or medical sociology.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 202c. Advanced Topics in the Behavioral Sciences: The Application of the Scientific Method to the Study of Behavior

Seminars. *One two-hour session each week, third period.* Dr. Benfari.
Credit 2 units.

This seminar covers various issues involved in the empirical study of behavior. Topics considered are: the nature of science, operationalism, models of causation, logical bases of inference, construct validity, clinical versus statistical prediction, and the difference between verification and discovery. The course is designed to prepare students for conducting research and utilizing research results in public health especially in the mental health field.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 202d. Advanced Topics in the Behavioral Sciences: Field Surveys in Psychiatric Epidemiology

Seminars. *One two-hour session each week, fourth period.* Dr Leighton and Dr. Beiser.

Credit 2 units.

This course is complementary to Behavioral Sciences 204c, and carries further the review of problems, concepts and methods in psychiatric epidemiology. Emphasis is given to the assessment of mental health in total populations, regardless of the utilization of treatment services and institutions. While the full range of psychiatric disorders is considered, particular attention is given to neuroses, psychosomatic disturbances and to personality disorders. Approaches to the study of environmental factors are of major concern. The course is primarily for students interested in social psychiatry.

Prerequisites: Behavioral Sciences 204c, or the permission of the Instructor.

Behavioral Sciences 203a,b. Personality Assessment in Field Surveys

Seminars. *One two-hour session each week, first and second periods.* Dr. Beiser and Staff of the Department.

Credit 5 units.

This course will familiarize the student with various data-gathering techniques such as clinical interviews, structured questionnaires, psychological tests, peer judgments and standardized observations which have been used in studying mental health and illness in populations.

A segment of the course will deal with the conceptualization and measurement of positive adaptation, in addition to the more traditional concerns of assessing psychiatric disorder.

Attention will be given to problems of assessing the mental health of children.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 204c. Psychiatric Epidemiology: Problems, Concepts and Methods

Seminars. *One two-hour session each week, third period.* Dr. LEIGHTON and Staff of the Department.

Credit 2 units.

The aim of the course is to introduce students to the field of psychiatric epidemiology. Such major objectives as description, etiological investigation, and the applications of epidemiological methods to service needs are reviewed. Emphasis is on major psychoses such as schizophrenia and on the use of data obtained from psychiatric treatment services and institutions.

Prerequisites: Epidemiology 201a,b, Biostatistics 101a,b, or permission of the Instructor.

Behavioral Sciences 206a. Cross-Cultural Psychiatry

Lectures and Seminars. *One two-hour session each week, first period.* Dr. MURPHY.

Credit 2 units.

This course is designed for public health workers who desire to increase their knowledge regarding mental health and mental illness in contrasting cultural groups. The ground covered includes cultural relativity, cross-cultural epidemiology of psychiatric disorders, and the effects of rapid cultural change, poverty, and sociocultural disintegration. Indigenous practices for the treatment of the mentally ill in non-Western societies are described and their implications discussed. Various contemporary experiments concerned with meeting the psychiatric needs of developing countries are examined.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 207c,d. Critical Issues in Community Psychiatry

Seminars. *One two-hour session and two hours of field work each week, third and fourth periods.* Dr. BEISER and Dr. SHAPIRO.

Credit 3 units.

Will not be given in 1971–72.

This series of sixteen seminars deals with the development of the community mental health movement in its relationship to psychiatry, public health, and social welfare. The prevention of psychiatric disorder is given special attention as representing a crucial social issue of general concern. Preventive programs, both past and present, are critically examined. In addition, students are given individual reading assignments.

Field work entails observing and reporting on ongoing and projected programs for the prevention of mental illness at local and state levels. Planning of research will be encouraged.

Behavioral Sciences 208c,d. Urban Social Problems

Lectures and discussions. *One two-hour session each week, third and fourth periods.* Dr. Benfari and Staff of the Department.

Credit 5 units.

This seminar will focus on current urban problems and their relationships to certain minority groups. The format will be readings, films, case analyses, and discussions to highlight typical problem areas such as welfare, education, employment and health that pertain to the hard core poor. The course will cover the concept of poverty, its operational definitions, the qualitative and quantitative aspects of the low income style of life, concepts of prejudice and discrimination, urban problems, identity problems in minorities as groups and as individuals and the polarization process. This course is designed for the public health and social science student who seeks understanding of these relationships using a functional model. The course hopes to raise issues for discussion and to achieve appreciation for the complexity of the problems rather than to present solutions.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 209c. Sociological Functioning of Health Agencies

Seminars. *One two-hour session each week, third period.*

Credit 1 unit.

Will not be given in 1971–72.

This course offers a comparative sociological review of the structure and function of major types of organizations involved in the provision of health services and programs, including the general hospital, mental hospital, local health department, and state and federal health services. It includes the analysis of major ways in which elements of the organization may promote or impede the achievement of goals. Attention is given to varying modes of administrative management, motivations of personnel, systems of control, problems in acquiring resources, and patterns of inter-agency relationships.

Behavioral Sciences 210d. Inducing Social Change

Seminars. *One two-hour session each week, fourth period.* Dr. Mertens and Staff of the Department.

Credit 2 units.

This course is designed for various specialists in public health who are charged with responsibility for introducing changes in organizations and communities. The subject matter includes methods and theories of teaching, principles of individual and group psychotherapy, approaches to sensitivity training and group dynamics, and organizational theory. Techniques

and procedures illustrating these theories are presented. The general aim of familiarizing students with existing theories and techniques of inducing social changes is pursued through readings, discussions, and case illustrations.

Behavioral Sciences 211d. Industrial Psychiatry

Lectures, readings, and case illustrations. *One two-hour session each week, fourth period.* Dr. MERTENS.

Credit 2 units.

The course is designed to provide basic information relevant to clinical and case management in industrial and other organizational settings. It analyzes research and clinical findings in such a way as to prepare students to handle not only individual maladaptation, but also disintegration at the organizational level.

The course has a fourfold frame of reference, handling successively etiology and symptomatology of individual and group dysfunction.

It is available to students who already have a basic knowledge of psychopathology.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 212c. Antisocial Behavior

Seminars. *One two-hour session each week, third period.* Dr. LEIGHTON and Dr. ROLDE.

Credit 1 unit.

This seminar will serve as an introduction to a set of issues which are central to the times and are of increasing importance and relevance to those working in Public Health. The focus will be on types of behavior of individuals who are considered sick or immoral by the majority or the controlling elements of society: e.g. juvenile delinquency, drug addiction, alcoholism, the psychopath, etc. Current views on causation, treatment and prevention will be examined.

Topics will include the life experience of those regarded as outcasts by society, the usefulness of the framework of deviance and control as an alternative to a health-illness perspective, and the necessity and difficulty of an integrated social and psychological approach. The readings will include classics on the topic, many of which are traditionally not part of the education of those in the health field. Throughout the course emphasis will be placed on the avoidance of stereotypic approaches, and the readings and discussion will be interdisciplinary.

Enrollment is subject to the approval of the Instructors.

Behavioral Sciences 300a,b,c,d,e. Tutorial Programs

Time and credit to be arranged. Staff of the Department.

Arrangements can be made for a reading course in selected topics or practical experience in research.

Behavioral Sciences 330e. Field Study

A limited number of openings exist for research experience in the Department's field stations. These opportunities vary in nature from time to time according to the stages of various research projects. Individual arrangements can be made through the Head of the Department.

Behavioral Sciences 350. Research Training

Training in research is available to doctoral candidates through individual arrangements with the Staff of the Department.

Department of Biostatistics

Robert B. Reed, A.B., A.M., PH.D., A.M. (hon.), Professor of Biostatistics *and* Head of the Department

Jane Worcester, A.B., DR.P.H., S.D. (hon.), Professor of Biostatistics and Epidemiology

Jacob J. Feldman, PH.D., Professor of Biostatistics

*Yvonne M. M. Bishop, B.A., S.M. IN HYG., PH.D., Associate Professor of Biostatistics; *Statistician to the Children's Cancer Research Foundation*

Margaret E. Drolette, A.B., M.P.H., PH.D., Associate Professor of Biostatistics

*Todd M. Frazier, A.B., S.M., Associate Professor of Biostatistics; *Assistant Director, Center for Community Health and Medical Care.*

Olli S. Miettinen, M.D., M.P.H., M.SC., PH.D., Associate Professor of Epidemiology and Biostatistics.

*Ellen W. Jones, A.B., M.P.H., Lecturer on Biostatistics; *Assistant Director, Center for Community Health and Medical Care*

James H. Warram, Jr., S.B., M.D., S.M. IN HYG., Assistant Professor of Biostatistics

*Beverly J. Beers, A.B., A.M., M.P.H., PH.D., Instructor in Biostatistics; *Associate in the Center for Community Health and Medical Care*

*Natalie A. Harris, A.B., A.M., Teaching Fellow in Biostatistics

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Theodore Colton, A.B., S.M., S.D., *Associate Professor of Preventive Medicine, Harvard Medical School*

The teaching aims of the Department may be divided very generally into three categories:

First, it is essential for workers in all branches of public health to be able to draw justified conclusions from numerical data and to base logical action on these conclusions. This applies to the administrator who must evaluate problems and the results of his activities, as well as to the epidemiologist and the research worker who must apply statistical techniques to their laboratory and field problems. The required course in Biostatistics is therefore designed to give a minimum command of simple statistical methodology to all students.

* Part-time in the School of Public Health.

Second, it is essential for field and laboratory researchers to be able to use statistical methods in planning and analyzing their experiments and problems. Elective courses are designed to provide an introduction to methodology in this area. These courses are adapted to the needs of students of this School, many of whom have broad backgrounds in biological sciences while few have extensive preparation in mathematics. A minimum of mathematical exposition is therefore included in courses intended for students in these categories. Instead the emphasis is on understanding the statistical procedures and the ability to carry out indicated analyses effectively.

Third, there is a smaller group of students particularly interested in pursuing further work along mathematical lines. Their requirements are fulfilled, on the one hand, by the provision of advanced and seminar courses in the Department; on the other, by the offerings of the Department of Statistics in the Graduate School of Arts and Sciences.

Training in the use of computing machinery and the opportunity to study computing techniques are available in the School's Health Sciences Computing Facility. This facility is equipped with punch card machines and a remote job entry terminal to the IBM 360/65 computer located in the Harvard Computing Center, Cambridge. Teletype terminals are provided for interactive use with various time-sharing systems.

Any course in the Department is open to any student who meets the prerequisites stated in the course description.

Biostatistics 101a,b. Principles of Biostatistics

Lectures. *Two one-hour sessions each week, first and second periods.*

Laboratory. *One three-hour session each week, first and second periods.* Staff of the Department.

Credit 3.5 units.

Recommended as part of basic core curriculum for Master of Public Health candidates. Required of Master of Science candidates.

Lectures and laboratory exercises introduce the student to demographic concepts: the structure of the population and the use of the life table; the nature and composition of rates and their use from administrative and epidemiological points of view. The course forms an introduction to the theory of measurements and distributions, including the testing of significance of differences and the interaction of variables. Finally, the student is introduced to basic concepts of probability and association, sampling techniques and construction of controlled experiments such as clinical trials.

Biostatistics and Epidemiology 202b,c,d. Design of Investigations

Seminars. *One two-hour session each week, second, third and fourth periods.* Dr. MACK.

Credit 3 units.

This course is for students with a major interest in epidemiology or biostatistics. Participants select a problem in apparent need of investigation, and prepare and present for group discussion a summary of the present status of knowledge of the problem and the design of a study directed towards advancement of present knowledge.

Enrollment is subject to the approval of the Instructor.

Biostatistics 203c,d. Statistical Methods in Research

Lectures, discussions and laboratory. *Two three-hour sessions each week, third and fourth periods.* Dr. Reed, Dr. Worcester and Dr. Drolette.

Credit 5 units.

This course, a continuation of Biostatistics 101a,b, introduces the student to technical statistical procedures important in problems of laboratory and field research. Topics included are further considerations of probability and correlation, together with an introduction to procedures used in the planning of experiments, including variance analysis, non-parametric methods, dosage response and maximum likelihood.

Prerequisites: Basic preparation in statistics and epidemiology.

Biostatistics 204c,d. Mathematical Foundations of Biostatistics

Lectures. *One two-hour session each week, third and fourth periods. Time to be arranged.* Dr. Drolette.

Credit 2.5 units.

The material covered includes mathematical descriptions of commonly used distributions, standard procedures for estimating the moments of a distribution and mathematical foundations of statistical inference, including the Neyman-Pearson lemma, the likelihood ratio, the central limit theorem and power.

Prerequisite: A course in elementary calculus.

Biostatistics 205c,d. Survey Research Methods in Community Health

Lectures and discussions. *Two one-hour sessions each week, third and fourth periods.* Dr. Feldman.

Credit 2.5 units.

Research design, sample selection, questionnaire construction, interviewing techniques, the reduction and interpretation of data, and related facets of population survey investigations are covered in this lecture and reading course. The course is focused primarily on the application of survey methods to problems of health program planning and evaluation. The treatment of methodology is sufficiently broad so as to be suitable also for students who are concerned with applications to epidemiological, nutritional or other types of survey research.

Biostatistics and Epidemiology 206c,d. Research Methods in Epidemiology

Lectures. *One two-hour session each week, third and fourth periods.* Dr. Worcester and Staffs of the Departments of Biostatistics and Epidemiology.

Credit 2.5 units.

Primarily for Master of Science and doctoral candidates in Epidemiology or Biostatistics.

This course is concerned with statistical and other problems commonly encountered in epidemiologic research. Examples include assessment of data quality, misclassification, nonresponse, population sampling, matching, and analytic techniques for birth order effects, time-space clusters, cyclical variations, and measurement of survival.

Prerequisite: Enrollment in Biostatistics 203c,d.

Enrollment is subject to the approval of the Instructor.

Biostatistics 210a,b. Advanced Topics in Biostatistics

Seminar. *One two-hour session each week, first and second periods.* Staff of the Department.

Credit 2.5 units.

The subject matter of this course varies from year to year. During the year 1971–72, Biostatisitcs 210a,b. will concentrate upon practical applications of multivariate statistical methods.

The course is intended primarily for students specializing in Biostatistics. Other students may be admitted by obtaining the consent of the Department.

Biostatistics 213e. Introduction to Computing

One full week is offered twice a year, one-week period between Fall and Spring terms and week following Spring term. Staff of the Health Sciences Computing Facility.

Credit 1 unit.

Lecture and laboratory exercises provide an opportunity to learn fundamental procedures in the processing of data with computers. Laboratory exercises are conducted using equipment in the Health Sciences Computing Facility.

Biostatistics and Health Services Administration 216c,d. Health Program Evaluation

Seminars and Tutorials. *One two-hour seminar in first week of third period; weekly tutorial group meetings for remainder of third period; one two-hour seminar each week, fourth period.* Dr. Densen, Dr. Feldman, Mr. Frazier, Mrs. Jones and Dr. Reed.

Credit 2.5 units.

This course is designed for students interested in the evaluation of on-

going health programs. After an introduction to the literature on evaluation methods, students are assigned to groups, each of which designs an evaluation proposal for a specific health program. During the fourth period seminars, these proposals are presented and critically analyzed by the students.

Biostatistics 310–315a,b,c,d. Tutorial Programs

Time and credit to be arranged. Staff of the Department.

An opportunity for tutorial work at the Master's level is offered for interested and qualified students or small groups of students. Arrangements must be made with individual faculty members and are limited by the amount of faculty time available. These tutorial programs are open to students specializing in Biostatistics and also to students in other fields who wish to go beyond the content of the regular courses. Six broad categories of this tutorial instruction are identified by the six course numbers below.

310 *Tutorial in Statistical Methods.*

Guided study in specific areas of statistical methodology and application.

311 *Tutorial in Teaching.*

Work with the Department in laboratory instruction and the development of teaching materials.

312 *Tutorial in Consultation.*

Work with members of the Department on current statistical consultation activities.

313 *Tutorial in Computing.*

Guided study in scientific programming, numerical methods and data management.

314 *Tutorial in Study Design.*

Guidance in developing statistical design of a study in which the student has a particular interest.

315 *Tutorial in Data Analysis.*

Guidance in the statistical analysis of a body of data in which the student is interested.

Biostatistics 350. Research

Candidates for the Doctors of Public Health, Doctor of Science or other doctoral degrees may arrange for individual research. The work may be part of the program for a doctorate in this Department or may be integrated with doctoral research in other departments.

Students may register for Biostatistics 310–315 for a maximum of ten credit units in the summer term.

Environmental Health Interdepartmental Courses

The following courses are conducted by the Faculty and Staff of The Kresge Center for Environmental Health which includes the Departments of Environmental Health Sciences, Physiology, and Sanitary Engineering.

Environmental Health Interdepartmental 201a, 201b. Principles of Environmental Health

Lectures, discussions and tours. *Two one-hour sessions and one two-hour session each week, first and second periods.* Dr. MOELLER and Staff of the Center.

Credit 2 units in each period.

The purpose of this course is to review some of the more important problems associated with man and his environment. Although the sources, biological effects, and control of various environmental stresses are considered on an individual basis, major emphasis is on dealing with environmental health problems as a totality. Included within the course is a series of Case Studies in which participants are provided an opportunity to discuss in depth on a small group basis several of the more controversial subjects within environmental health. Supplementing the lectures are on-site visits to provide students with knowledge of the operation of water purification and waste treatment facilities, solid waste handling procedures, industrial medical programs, and activities within a radiological health research and monitoring laboratory.

The course schedule has been arranged so that Master of Science candidates may elect either the first or second period to obtain coverage of specific topics. Both periods of the course are recommended as part of the core curriculum for Master of Public Health candidates. Subjects presented during the "a" period include water purification and waste water treatment, rural sanitation, management of solid wastes, accident prevention, and noise and other physical stresses. Subjects presented during the "b" period include air pollution, ionizing and non-ionizing radiation, occupational health, toxicology, and environmental and respiratory physiology.

Environmental Health Interdepartmental 202c,d. Community Environmental Health Management

Lectures, discussions, and role playing. *One three-hour session each week, third and fourth periods.* Dr. MOELLER and Staff of the School of Public Health.

Credit 2 units.

This is a computerized game which simulates a metropolitan environment

by including a basic set of data on such factors as air pollution characteristics, employment, land use, and public services. The data are organized into models which show the inter-relationships of these factors in the life of a community. Through playing roles such as those of air pollution control officers, politicians, town planners, industrialists, and land developers, students are given the opportunity to make decisions on issues raised by those living in and making up the community. Such decisions include those on annual budgets and tax rates as well as those related to problems arising out of the changing environment. The impact of the actions of the students is obtained by feeding into a computer their decisions coupled with overall data on the hypothetical community. The computer then evaluates the effects of their actions on the community and presents the data in summary form for follow-up action by game participants. The course has proven particularly effective as a means of providing students experience in applying information and techniques gained in a variety of courses offered at the School of Public Health.

Enrollment will be limited to 60 students.

Environmental Health Interdepartmental 203a,b,c,d. Aerospace Health and Safety

Seminars. *One two-hour session each week, first, second, third and fourth periods.* Dr. McFarland and Dr. Dougherty.

Credit 5 units.

The purpose of these seminars is to integrate the work in the basic courses of public health and preventive medicine with the specialized problems of aerospace health and safety. Lectures and discussions are arranged throughout the year, led by the students, the Instructor, and various biological and medical specialists in the University. Visiting lecturers from other universities and research centers also participate in the seminar. Each student will participate in the clinical or industrial hygiene program of the Massachusetts General Hospital Medicine Station at Logan International Airport.

Enrollment is subject to the approval of the Instructor.

Environmental Health Interdepartmental 204c, 204d. Human Factors in Occupational Performance and Safety

Lectures and demonstrations. *One two-hour session each week, third and fourth periods.* Dr. McFarland and Dr. Stoudt.

Credit 1 unit in each period.

In the third period, the lectures and discussions emphasize the application of experimental psychology, anthropology, and biotechnology to the problems of occupational performance and adjustment. Consideration is given to the matching of psychological and physical abilities to job requirements.

Emphasis is placed on the importance of designing equipment and work practices in terms of human capabilities and limitations, including those related to fatigue, aging, and environmental stress. In the fourth period the lectures and seminars explore interdisciplinary methods in the analysis and prevention of accidents and injuries. While the major emphasis is on occupational safety, the prevention of other types of accidents is also included.

With the approval of the Instructor, either period may be taken separately.

Environmental Health Interdepartmental 206c,d. Occupational Medical Clinics

Clinics, Massachusetts General Hospital. *One two-hour session each week, third and fourth periods.* Dr. PETERS and Dr. MURPHY.

Credit 2 units.

These clinics are concerned with diseases due to occupation, such as silicosis, beryllium intoxication, coal miner's pneumoconiosis, and lead poisoning. Special clinics are held in ophthalmology and dermatology.

The clinics are limited to physicians and are not offered if less than four students enroll.

Environmental Health Interdepartmental 207c,d. Occupational Medicine

Lectures and seminars. *One two-hour session each week, third period; two two-hour sessions each week, fourth period.* Dr. PETERS, Dr. WILKINS, and Dr. TYLER.

Credit 3 units.

This course considers the traditional administration and organization of occupational medical departments. Standard practices of screening, physical exams and record keeping will be presented. Problems of absenteeism and alcoholism will be discussed.

In addition consideration will be given to federal, state and municipal programs in occupational health and how current legislation may affect them.

The worker's view of occupational health and safety will also be presented. Other topics covered will be multiphasic screening and telediagnosis as they apply to occupational medicine.

Functional evaluation of the disabled worker or the impact that non-occupational disease has on the working capacity of the individual will be covered at the Lemuel Shattuck Hospital. The criteria for returning such an individual to work will also be considered.

This course will be limited to physicians and will not be offered if less than four enroll.

Environmental Health Interdepartmental 208a,b. Operations Research in Environmental Health Engineering

Lectures and computer exercises. *Three hours each week, first and second periods; time to be arranged.* Dr. HARRINGTON.

Credit 3 units.

This course is an introduction to the concepts and techniques of operations research, applied to problems of environmental health sciences and engineering. Topics include the following: several interrelated mathematical techniques of optimization — Lagrangian methods, steepest descent, linear, nonlinear and dynamic programming, approximation theory; systems analysis of air and water treatment and solid waste disposal practices; applications of queueing theory, Markov processes, and statistical decision theory.

Prerequisite: Mathematics 20b (Differential Equations), or its equivalent, is desirable.

Enrollment is subject to the approval of the Instructor.

Environmental Health Interdepartmental 209c,d. Mathematical Modelling for Health Sciences

Lectures and discussions. *Three one-hour sessions each week, third period; two two hour sessions, fourth period.* Dr. Dawson.

Credit 4 units.

The primary purpose of the course is to develop the student's skill in applying basic mathematics to the formulation of quantitative problems in the health sciences. After a review of the necessary elementary concepts of algebra and calculus, the basic techniques for trajectory solution of ordinary differential equations will be developed.

Mathematical concepts and techniques will be taught in the context of modelling examples from population sciences, including ecology, and the bio-physical sciences, including physiology. The emphasis will be on the mechanistic rather than the phenomenological aspects of modelling. Probabilistic, as well as deterministic, models will be discussed.

In the fourth period, members of the class may devote their primary attention to one of the projects to be offered.

Prerequisite: Elementary calculus.

Environmental Health Interdepartmental 330e. Field Work

Credit 1 unit.

A week of supervised field observation is offered during the one-week period between Fall and Spring terms. Students may choose appropriate visits to medical or industrial hygiene departments of industries, airports, and other agencies which have operations or research in the field of environmental health.

The following courses are offered in the General Education program in Harvard College by members of the Kresge Center for Environmental Health. They are open to properly qualified students in the School of Public Health.

Consult the catalogue of the Faculty of Arts and Sciences for complete descriptions of these courses.

Natural Sciences 115. Models for the Control of Man's Physical Environment

Half course (*fall term*). *M., W., F. at 9.* Associate Professor HARRINGTON and Assistant Professor ROGERS.

Natural Sciences 132. Introduction to Environmental Health

Half course (*fall term*). *M. and W. at 12, and one discussion hour to be arranged.* Professor MOELLER.

[May not be taken for credit in addition to E. H. I. 201a, 201b.]

Department of Environmental Health Sciences

DADE W. MOELLER, S.B., S.M., PH.D., A.M. (hon.), Professor of Engineering in Environmental Health, Head of the Department *and* Associate Director, Kresge Center for Environmental Health

*MELVIN W. FIRST, S.B., S.M., S.D., Professor of Environmental Health Engineering

WILLIAM A. BURGESS, S.B. IN MECH.ENG., S.M., Associate Professor of Environmental Health and Safety Engineering; *Consultant on Environmental Health and Safety, University Health Services*

*RICHARD DENNIS, S.B., S.M., Associate Professor of Applied Environmental Health Engineering; *Director, Pollution Control Laboratory, G.C.A. Corporation, Bedford*

ABRAHAM S. GOLDIN, A.B., A.M., PH.D., Associate Professor of Radiochemistry

JAMES R. MAHONEY, S.B., PH.D., Associate Professor of Applied Meteorology

PARKER C. REIST, S.B., S.M., S.M. IN HYG., S.D. IN HYG., Associate Professor of Environmental Health Engineering

*GEORGE F. WILKINS, A.B., M.D., Associate Clinical Professor of Occupational Medicine; *Medical Director, New England Telephone Company*

†BENGT E. BJARNGARD, M.SC., D.SC., Lecturer on Medical Radiatoin Physics; *Assistant Professor of Radiation Therapy, Harvard Medical School*

*ALLEN L. CUDWORTH, S.B. IN E.E., S.M. IN E.E., S.D. IN HYG., Lecturer on Applied Acoustics and Environmental Health; *Assistant Vice President of Liberty Mutual Life Insurance Companies and Director, Research Center*

†JACOB SHAPIRO, S.B., S.M., PH.D., Lecturer on Biophysics in Environmental Hygiene; *Radiological Health and Safety Engineer, University Health Services*

*EDWARD W. WEBSTER, B.SC., PH.D., Lecturer on Medical Radiation Physics; *Associate Professor of Radiology, Harvard Medical School*

DWIGHT W. UNDERHILL, B.E., S.M. IN HYG., S.D. IN HYG., Assistant Professor of Environmental Health Engineering

*JAMES M. AUSTIN, B.A., M.A., S.D., Visting Lecturer on Meteorology and Air Pollution; *Professor of Meteorology, Massachusetts Institute of Technology*

*JOHN K. DANE, A.B., LL.B., LL.M., Visiting Lecturer on Workmen's Compensation; *Counsel, Liberty Mutual Insurance Companies*

* Part-time in the School of Public Health.
† Part-time in the School of Public Health, full-time in Harvard University.

*Sidney Edelman, A.B., LL.B., Visiting Lecturer on Environmental Health Law; *Assistant General Counsel, Division of Public Health Grants and Services, Office of General Counsel, U.S. Department of Health, Education and Welfare*

*Horace W. Gerarde, S.B., S.M., M.D., PH.D., Visiting Lecturer on Industrial Toxicology; *Corporate Medical Director — Occupational Health, Becton, Dickinson and Company*

*Nathan Van Hendricks, B.E., CHEM.E., Visiting Lecturer on Industrial Hygiene Engineering; *Assistant Director for Environmental Sciences, Standard Oil Company (New Jersey)*

*John H. Ludwig, S.B., S.M., S.M. IN HYG., S.D. IN HYG., Visiting Lecturer on Community Air Pollution; *Acting Chief, Office of Research and Monitoring, Environmental Protection Agency*

*Kenneth W. Nelson, ED.B., S.M., Visiting Lecturer on Environmental Health; *Director, Department of Environmental Sciences, American Smelting and Refining Company*

*Robert B. O'Connor, A.B., M.D., Visiting Lecturer on Occupational Medicine; *Vice President, Personnel and Health Services, U. S. Steel Corporation, (Pennsylvania)*

*Harry F. Schulte, B.CHEM.ENG., S.M., Visiting Lecturer on Environmental Health Engineering; *Group Leader, Industrial Hygiene Group, Los Alamos Scientific Laboratory, New Mexico*

*Frederick J. Viles, Jr., S.B., S.M., Visiting Lecturer on Industrial Hygiene

*Oliver L. Welsh, S.B., A.M., ED.D., Visiting Lecturer on Audiology; *Chief Audiologist, Veterans Administration Clinic, Boston*

Mary E. Coffey, S.B., S.M., Teaching Fellow in Environmental Health Sciences

*Myra Karstadt, S.B., A.M., PH.D., Teaching Fellow in Environmental Health Sciences.

Peter J. Knapp, S.B., S.M. IN HYG., Teaching Fellow in Environmental Health Sciences

James P. Kornberg, S.B., S.M., Teaching Fellow in Environmental Health Sciences

Robert M. Patterson, A.B., S.M. IN HYG., Teaching Fellow in Environmental Health Sciences

Stephen N. Rudnick, S.B., S.M., S.M. IN HYG., Teaching Fellow in Environmental Health Sciences

John D. Spengler, S.B., PH.D., Research Associate in Meteorology

Otto Grubner, PH.D., Research Associate in Environmental Chemistry

EBERHARD K. JOCHEM, DR. ENG., Research Fellow in Chemical Engineering

*JANET W. CARES, S.B., S.M. IN HYG., Assistant in Industrial Hygiene

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HARRIET L. HARDY, A.B., M.D., *Lecturer on Medicine, Harvard Medical School; Assistant Medical Director in charge of Environmental Medical Service, Massachusetts Institute of Technology*

ALBERT O. SEELER, A.B., M.D., *Lecturer on Medicine, Harvard Medical School; Professor and Medical Director, Massachusetts Institute of Technology*

STANLEY J. ADELSTEIN, S.B., S.M., M.D., PH.D., *Associate Professor of Radiology, Harvard Medical School*

Because of the growing public awareness of the need for environmental pollution control and worker protection, an increasing amount of attention is being focused on these problems at all levels of our society. At the Harvard School of Public Health, research and training have been conducted on these subjects since 1926. Applicable curricula offered by the Department of Environmental Health Sciences include Air Pollution Control, Radiological Health, and Industrial Hygiene. These programs are open to engineers, physicians, and other professional personnel with undergraduate backgrounds in physics, chemistry, and biology.

Graduate training in each of the fields covered by the Department includes courses on human physiology, epidemiology and biostatistics. Typical courses selected as electives in the several options may be as follows:

Air Pollution Control

Community Air Pollution (Environmental Health Sciences 261c,d)
Meteorological Aspects of Air Pollution (Environmental Health Sciences 262c,d)
Instrumental Methods for Environmental Analysis (Environmental Health Sciences 263a,b)
Identification and Measurement of Air Contaminants (Environmental Health Sciences 264c,d)
Aerosol Technology (Environmental Health Sciences 253a,b)
Principles of Toxicology (Physiology 205c, 205d)

Industrial Hygiene

Basic Problems in Occupational Health and Industrial Environments (Environmental Health Sciences 251c,d)
Environmental Control (Environmental Health Sciences 252c, 252d)
Human Factors in Occupational Performance and Safety (Environmental Health Interdepartmental 204c, 204d)
Environmental Physiology (Physiology 204c)

Instrumental Methods for Environmental Analysis (Environmental Health Sciences 263a,b)
Principles of Toxicology (Physiology 205c, 205d)
Aerosol Technology (Environmental Health Sciences 253a,b)

Radiological Health

Introduction to Radiation Protection (Environmental Health Sciences 271a,b)
Radiation Biology (Physiology 207c,d)
Radiation Protection Engineering (Environmental Health Sciences, 272a,b)
X-ray Protection (Environmental Health Sciences 274c,d)
Aerosol Technology (Environmental Health Sciences 253a,b)
Problems in Radiation Dosimetry (Environmental Health Sciences 273c,d)

Supporting the teaching program are extensive research activities. Current studies include an evaluation of performance factors for respirators and gas masks, the application of computer analysis to automatic particle sampling and respiratory deposition, the development and testing of containment systems for nuclear power reactors, the design of cleanup systems for radioactive sodium aerosols, the application of gas- and liquid-phase reactions to particulate and gas removal, a numerical study of urban scale atmospheric transport, the monitoring of worker stresses by telemetered physiological measurements, and an investigation of methods for reducing the population dose from radiation sources of natural origin. Supporting these studies are related cooperative research projects conducted by the Departments of Physiology and Epidemiology. As a result, students have many excellent opportunities for research, either on an independent basis or as a participant in an ongoing project.

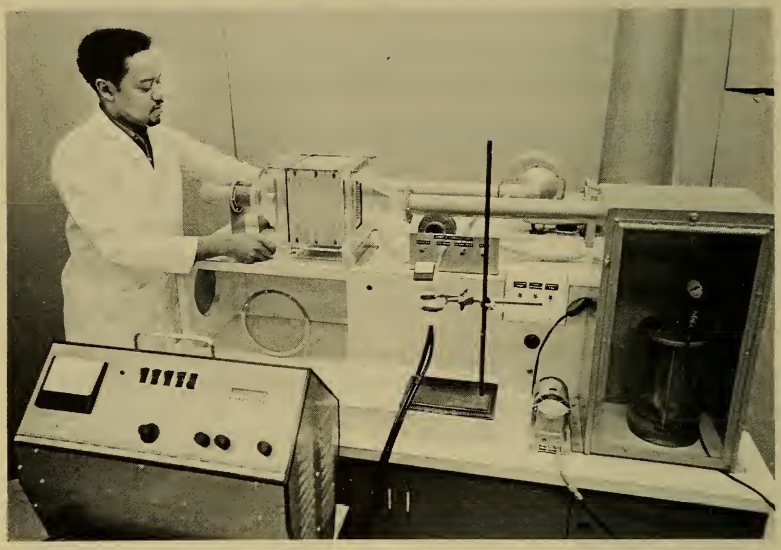
As may be noted, some of the courses in this Department carry "Engineering" numbers. These are cross listed in the catalog of the Division of Engineering and Applied Physics in Cambridge and provide course credit through that Division as well as the School of Public Health.

Environmental Health Sciences 202a,b,c,d. Departmental Seminar

Seminars. *One one-hour session each week, first, second, third and fourth periods.* Staff of the Department.

Credit 2 units.

The purpose of these seminars is to supplement the formal course work of the Department of Environmental Health Sciences by bringing to the attention of the students a wide range of topics of contemporary interest in air pollution control, industrial hygiene, and radiological health. Initial sessions are led by faculty members of the Kresge Center for Environmental Health and cover current research activities within the Center. Subsequent sessions include critical reviews of assigned subjects by students within the Depart-



This unit demonstrates the application of high efficiency particulate filters for atomic engineering installations.

ment. Such reviews will be evaluated on the basis of the student's ability to digest and present information on a given topic in an orderly fashion, as well as his ability to evaluate published research papers from the standpoint of the significance of the study, the experimental method, evaluation of the results, and organization of the manuscripts. During other portions, the seminars will be led by specialists from other parts of the University and from industrial, governmental, and university research centers.

Environmental Health Sciences 251c,d. Basic Problems in Occupational Health and Industrial Environments (Engineering 282)

Lectures. *Two two-hour sessions each week, third and fourth periods.*

Laboratory demonstrations and field trips. *One three-hour session each week, third and fourth periods.* Dr. Ferris, Dr. First, and Staff of the Kresge Center.

Credit 5 units.

A course of lectures, laboratory demonstrations and inspections of work places showing the relation of working conditions to health with special reference to control of industrial hazards. Examples include adverse condi-

tions of temperature, humidity, radiation, and chemical and physical irritants. Particular emphasis is given to the prevention, diagnosis, and treatment of industrial disability and disease, and to workmen's compensation.

Prerequisite: Physiology 203a,b.

Environmental Health Sciences 252c, 252d. Environmental Control (Engineering 280)

Lectures. *Two one-hour sessions each week, third and fourth periods.*

Laboratory. *One three-hour session each week, third and fourth periods.* Mr. Burgess and Dr. Cudworth.

Credit 2.5 units in each period.

To be given in 1972–73; will not be given in 1971–72.

The operations and processes used in modern industry may release toxic fumes, gases, mists, and vapors to the workplace. The most important control measure for such airborne contaminants is exhaust ventilation. The first half of this course includes lectures and laboratory topics in the design and evaluation of industrial ventilation systems. Lecture topics include flow of fluids, principles of hood and duct design, fans and blowers, and special topics such as make-up air systems and air conditioning fundamentals. Laboratory sessions include calibration of air flow measuring instruments and their use in evaluating systems, performance studies of hood and air movers in the laboratory and industrial plants, and a major ventilation design problem.

The second half of the course is designed for the environmental health specialist who will have responsibility for the evaluation and control of noise hazards. Topics covered include sound generation and propagation, measurements and instrumentation, transmission and absorption, and specific control approaches for production equipment, air movers, and hydraulic systems. Laboratory sessions will provide the student with practical experience in the evaluation of sound sources and the prediction of noise hazards. Useful control techniques will be demonstrated and evaluated in order to provide a systematic approach to noise reduction and hazard elimination.

Environmental Health Sciences 253a,b. Aerosol Technology (Engineering 286)

Lectures. *Two one-hour sessions each week, first and second periods.*

Laboratory. *One two-hour session each week, first period; one four-hour session each week, second period.* Dr. Reist.

Credit 5 units.

This course deals with the properties of particulate clouds and the physical principles underlying their behavior, including aerosol measurement. Topics include individual particle trajectories, diffusion, condensation and evapora-

tion, electrical and optical properties, and coagulation, as well as the behavior of the cloud *in toto*.

Environmental Health Sciences 261c,d. Community Air Pollution*

Lectures, demonstrations, and seminars. *One two-hour session each week, third and fourth periods.* Dr. First and Staff of the Center.

Credit 2.5 units.

This lecture and seminar course is designed for engineers, chemists, and physicians interested in air pollution control. Topics presented include the measurement and control of community air pollution; air quality standards; health effects of air pollution; damage to animals, plants and property; community and site surveys; the legal and enforcement aspects of air pollution control; and the nature and quantity of atmospheric emissions from transportation vehicles, municipal incinerators and specific industries.

Environmental Health Sciences 262c,d. Meteorological Aspects of Air Pollution*

Lectures and demonstrations. *One two-hour session each week, third and fourth periods.* Dr. Mahoney.

Credit 2.5 units.

This course presents an evaluation of the meteorological factors associated with the transport of air pollutants. Topics include the properties of the atmosphere near the ground, turbulent dispersion of pollutants, instrumentation for evaluating the movement and behavior of air pollutants, atmospheric diffusion equations, diffusion from single and area sources, and mathematical models for evaluating urban air pollution. Applications of meteorological theory to air pollution phenomena are emphasized through demonstrations and the assignment of specific problems.

Admission is subject to the approval of the Instructor.

Environmental Health Sciences 263a,b. Instrumental Methods for Environmental Analysis (Engineering 281)

Lectures. *One two-hour session each week, first and second periods.*

Laboratory. *One three-hour session each week, first and second periods.* Dr. Goldin and Staff of the Department.

Credit 5 units.

This course offers methods for identifying and quantifying environmental contaminants. Specific sessions are devoted to theoretical and experimental consideration of electrometric, photometric (emission and absorption), and chromatographic techniques. Sampling methods are also discussed and some coverage is provided on methods for chemical separation and concentration.

* These two courses constitute Engineering 284.

The course is recommended for all students pursuing programs in Industrial Hygiene and Air Pollution Control. It is also suggested for students in the Radiological Health and the Master of Industrial Health Programs.

Environmental Health Sciences 264c,d. Identification and Measurement of Air Contaminants (Engineering 283)

Lectures. *Two one-hour sessions each week, third and fourth periods.*

Laboratory. *One three-hour session each week, third and fourth periods.* Dr. Goldin, Mr. Viles and Staff of the Department.

Credit 5 units.

This course emphasizes sampling and analytical methods for air contaminants plus related subjects not covered in Environmental Health Sciences 263a,b. Included are chemical methods of air analysis, dust identification, isokinetic sampling, duct and stack sampling, biological and solvent analysis, radioactive aerosol determinations, air pollution surveys and fire and explosion evaluations.

This course is intended for air analysts, engineers and physicians.

Prerequisite: Environmental Health Sciences 263a,b.

Environmental Health Sciences 271a,b. Introduction to Radiation Protection (Engineering 288)

Lectures. *Two one-hour sessions each week, first and second periods.*

Laboratory and field trips. *One three-hour session each week, first and second periods.* Dr. Goldin and Dr. Reist.

Credit 5 units.

This course is an introduction to the health and safety problems accompanying the use of particulate and electromagnetic radiation. Lecture topics include the elements of radioactivity; interaction of radiation with matter; methods for radiation protection; radiation protection standards; and the major sources of population exposure including natural background, x-radiation, nuclear power, electronic products, and microwave and laser applications. Classroom work includes assigned readings on radiation protection guides and the public health implications of nuclear facilities and radionuclide applications. Laboratory exercises provide an introduction to radiation sources, their measurement, and safe use.

Environmental Health Sciences 272a,b. Radiation Protection Engineering (Engineering 287)

Lectures. *Two two-hour sessions each week, first and second periods.* Dr. Shapiro.

Credit 5 units.

This course deals with the basic theory and calculations utilized in radiation control and nuclear safety. Specific topics include introduction to reactor physics, safeguards for preventing criticality and reactor accidents, radiation shielding, radiation damage, and analysis of environmental reactor hazards.

Prerequisites: Physics 112b or Environmental Health Sciences 271a,b.

Environmental Health Sciences 273c,d. Problems in Radiation Dosimetry

Lectures. *Two one-hour sessions each week, third and fourth periods;* Laboratory, *one three-hour session each week, third period.* Dr. SHAPIRO.

Credit 4 units.

To be given in 1971–72; will not be given in 1972–73.

This course deals with the experimental and theoretical methods of evaluating radiation fields and determining radiation dose rates. Special dosimetry problems for study in the laboratory are selected from the fields of health physics, nuclear engineering, and nuclear medicine.

Prerequisite: Environmental Health Sciences 271a,b.

Environmental Health Sciences 274c,d. X-ray Protection

Lectures. *One two-hour session each week, third and fourth periods.*

Laboratory. *One four-hour session each week, third and fourth periods. Time to be arranged.* Dr. WEBSTER.

Credit 5 units.

Will not be given in 1971–72.

This course covers the fundamentals of X-ray equipment (both industrial and medical), the design of X-ray installations, and procedures for radiation protection surveys and inspections. Considerations include both equipment and room design with emphasis on such items as leakage, collimation, filtration, primary and secondary barriers, workload, and protection of patients. X-ray measuring instruments are evaluated with respect to their use and calibration as well as to performance characteristics such as time response, energy dependence and directional dependence. Included in the course are several problem assignments ranging from the design of individual protective components up to, and including, the design of a complete protective installation.

Environmental Health Sciences 275c,d. Measurement and Applications of Radionuclides

Lectures. *One one-hour session each week, third and fourth periods.*

Laboratory. *One three-hour session each week, third and fourth periods.* Dr. GOLDIN and Dr. ADELSTEIN.

Credit 3 units.

Will not be given in 1971–72.

This course presents the fundamentals of radionuclide techniques for application to research problems in medicine, biology, and environmental control. Topics covered include the theory and practice of radionuclide identification and measurement, sampling and sample preparation, and radiochemical separations. Auxiliary techniques considered include activation analysis, production of short-lived nuclides, and isotope "milking." Laboratory sessions are arranged to permit an option so that students can perform experiments on either biochemical tracer applications or environmental radioactivity.

This course is intended for students and research workers in the medical and biological sciences or environmental health. Previous training or experience with radioactive materials is not required.

Environmental Health Sciences 301–305a,b,c,d,e. Tutorial Programs

Reading or Research. *Time and credit to be arranged.*

Reading or research assignments for individual tutorial work at a Master's degree level are provided for qualified students in the fields of industrial hygiene, industrial ventilation, aerosol technology, radiological hygiene, medical radiation physics, nuclear medicine, solid waste management and air pollution control.

301 *Air Pollution*, Dr. First and Dr. Mahoney.

302 *Industrial Hygiene*, Dr. Reist and Mr. Burgess.

303 *Radiological Health*, Dr. Goldin, Dr. Moeller and Dr. Shapiro.

304 *Medical Physics*, Dr. Bjarngard and Dr. Webster.

305 *Solid Wastes*, Dr. First.

Enrollment is subject to the approval of the Head of the Department.

Environmental Health Sciences 350–359. Research

Facilities of the Department are available for doctoral candidates and properly qualified second year master's degree students to pursue independent research on problems in industrial hygiene, aerosol technology, solid waste management, air pollution control and radiological health. Areas currently receiving study in the Department are as follows:

351 Evaluation of performance factors of respiratory protective devices; monitoring exposures of occupational groups to toxic air contaminants; ventilation control of airborne contaminants; evaluation and control of noise (Mr. Burgess).

352 Application of gas- and liquid-phase reactions to particulate and gas removal; development and design of cleanup systems for airborne contaminants from industrial and nuclear power plant facilities; incineration of solid

wastes including municipal, radioactive, biological and laboratory materials (Dr. First).

353 Measurement and control of environmental radiation; application of radiation and radioactive materials to environmental health problems; radiation safety in the use of nuclear energy (Dr. Goldin).

354 Computer modelling of pollutant transport in urban atmospheres; analysis of air quality data derived from sampling networks; meteorology of urban areas (Dr. Mahoney).

355 Reduction of population dose from sources of natural origin; environmental protection for nuclear facilities; radiation safety criteria and standards (Dr. Moeller).

356 Sampling and analysis of aerosol particles both in the ambient atmosphere and under laboratory conditions; generation of monodisperse aerosols; uses of aerosols in environmental health; development of particulate removal equipment (Dr. Reist).

357 Evaluation and control of hazards from radioactive contamination; dosimetry of radiation from high energy accelerators (Dr. Shapiro).

358 Medical radiation physics with emphasis on dosimetry, nuclear medicine and radiation therapy (Dr. Bjarngard).

359 Medical radiation physics with emphasis on survey techniques, instrumentation, and image quality and patient dose reduction in daignostic radiology (Dr. Webster).

Enrollment is subject to the approval of the Head of the Department.

Department of Epidemiology

Brian MacMahon, M.B., CH.B., D.P.H., PH.D., S.M. IN HYG., M.D., Professor of Epidemiology *and* Head of the Department

Jane Worcester, A.B., DR.P.H., S.D. (hon.), Professor of Biostatistics and Epidemiology

*Thomas F. Pugh, M.D., M.P.H., Associate Professor of Applied Epidemiology; *Director, Evaluation, Research and Statistics, Massachusetts Department of Mental Health*

Ascher J. Segall, M.D., M.P.H., DR.P.H., Associate Professor of Epidemiology

Olli S. Miettinen, M.D., M.P.H., M.SC., PH.D., Associate Professor of Epidemiology and Biostatistics.

Philip T. Cole, A.B., M.D., M.P.H., DR.P.H., Assistant Professor of Epidemiology

Thomas M. Mack, A.B., M.D., M.P.H., Assistant Professor of Epidemiology

Richard R. Monson, S.B., M.D., S.M. IN HYG., S.D. IN HYG., Assistant Professor of Epidemiology

Stella B. Yen, M.D., M.P.H., Research Associate in Epidemiology

*George B. Hutchison, A.B., M.D., M.P.H., Visiting Lecturer on Epidemiology; *Staff Member, Michael Reese Hospital and Research Institute, Chicago*

*Robert W. Miller, A.B., M.D., M.P.H., DR.P.H., Visiting Lecturer on Epidemiology; *Chief, Epidemiology Branch, National Cancer Institute*

*Ralph S. Paffenbarger, Jr., A.B., B.M., M.D., DR.P.H., Visiting Lecturer on Epidemiology; *Chief, Bureau of Chronic Diseases, California Department of Public Health, Berkeley*

*Emilio C. Venezian, B.ENG., S.M., PH.D., Lecturer on Epidemiology; *Member, Operations Research Section, Arthur D. Little, Inc., Cambridge*

Richard K. Donelson, M.D., M.P.H., Teaching Fellow in Epidemiology

Katsuhiro Fukuda, M.D., DR. MED. SCI., Research Fellow in Epidemiology

Robert N. Hoover, A.B., M.D., S.M. IN HYG., Teaching Fellow in Epidemiology

Kenneth J. Rothman, A.B., D.M.D., M.P.H., Teaching Fellow in Epidemiology

Raymond R. Neutra, A.B., M.D., M.P.H., Research Fellow in Epidemiology

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Hermann Lisco, M.D., *Lecturer on Pathology and Associate Dean for Student Affairs, Harvard Medical School*

* Part-time in the School of Public Health.

Robert L. Glass, s.b., d.m.d., m.p.h., dr.p.h., *Associate Clinical Professor of Ecological Dentistry, Harvard Dental School*

Frank E. Speizer, a.b., m.d., *Assistant Professor of Medicine, Harvard Medical School*

The major objective of the Department of Epidemiology is to provide opportunities for training and experience in the application of epidemiologic research methods to the investigation of diseases of unknown etiology. Emphasis is on the cardiovascular and mental disorders, the malignant neoplasms, abnormalities of reproduction and development, and other major diseases for which preventive measures are still unknown or inadequate.

A one-year research-training program leads to the degree of Master of Science in Epidemiology. This program usually includes the following courses: Epidemiology 201a,b, 203c,d, and 208b; Biostatistics 101a,b, 203c,d, and 213e; and Biostatistics and Epidemiology 202b,c,d, and 206c,d — a total of 21 credit units. The remainder of the credits required for the degree may be taken as additional formal courses in areas of special interest, or as supervised research (Epidemiology 300a,b,c,d).

For qualified students the period of research training may be extended by admission to either of the doctoral programs offered by the School, by admission to special student status, or through other individual arrangements. Most of the training period beyond the master's degree is occupied in supervised research experience. Potential doctoral candidates must plan at least two years in residence beyond completion of the master's degree.

A three-year residency in the Department of Epidemiology has been approved as satisfying residency requirements of the American Board of Preventive Medicine for certification in General Preventive Medicine. Requirements of the approved residency and of the School's degree programs may be satisfied simultaneously.

Fellowships for research training programs are provided in U.S. Public Health Service training grants to the Department. The Public Health Service also has a program of traineeship grants for support of residents in approved preventive medicine residencies. Traineeships from these sources are restricted to U.S. citizens or physicians who have been admitted to the United States for permanent residence. Applications should be submitted through the Department of Epidemiology.

Epidemiology 201a,b. Principles of Epidemiology

Lectures, laboratories, and seminars. *One one-hour and one two-hour session each week, first and second periods.* Dr. Monson and Dr. MacMahon.

Credit 2.5 units.

Recommended as part of the core curriculum for Master of Public Health candidates. Required of Master of Science candidates.

Lectures, laboratory work and seminars on the purposes, principles and methods of epidemiology. Principles are illustrated by reference to classic epidemiologic investigations of infectious and non-infectious diseases.

Biostatistics and Epidemiology 202b,c,d. Design of Investigations

Seminars. *One two-hour session each week, second, third, and fourth* periods. Dr. MACK.

Credit 3 units.

This course is for students with a major interest in epidemiology or biostatistics. Participants select a problem in apparent need of investigation, and prepare and present for group discussion a summary of the present status of knowledge of the problem and the design of a study directed towards advancement of present knowledge.

Enrollment is subject to the approval of the Instructor.

Epidemiology 203c,d. Epidemiology of Chronic Diseases

Lectures and Seminars. *One two-hour session and one one-hour session each week, third and fourth periods.* Dr. COLE.

Credit 2.5 units.

A review of existing knowledge of the epidemiology of diseases of unknown etiology or associated with etiologic factors which are not at present known to be of infectious nature. Emphasis is on the more common conditions, including the degenerative and malignant diseases. Attention is given to the methodologic difficulties associated with the epidemiologic investigation of chronic diseases.

Biostatistics and Epidemiology 206c,d. Research Methods in Epidemiology

Lectures. *One two-hour session each week, third and fourth periods.* Dr. WORCESTER and Staffs of the Departments of Biostatistics and Epidemiology.

Credit 2.5 units.

Primarily for Master of Science and doctoral candidates in Epidemiology or Biostatistics.

This course is concerned with statistical and other problems commonly encountered in epidemiologic research. Examples include assessment of data quality, misclassification, nonresponse, population sampling, matching, and analytic techniques for birth order effects, time-space clusters, cyclical variations, and measurement of survival.

Prerequisite: Enrollment in Biostatistics 203c,d.

Enrollment is subject to the approval of the Instructor.

Epidemiology 208b. Human Genetics

Lectures. *Two one-hour sessions each week, second period.* Dr. MIETTINEN.

Credit 1 unit.

The objective of this course is to give an introduction to the principles of genetic explanation of the occurrence of human illness. The topics covered include: chromosome aberrations as causes of disease; causes of chromosome aberrations; genes and the biochemical basis of inherited traits; inborn errors of metabolism; ascertainment and other problems in exploring mode of inheritance by means of family data; consanguinity; evaluation of the relative roles of genetic and environmental components in disease etiology (with special emphasis on twin studies); blood group incompatibility; and some aspects of population genetics.

Epidemiology 209d. Epidemiology of Oral Diseases

Lectures and seminars. *One two-hour session each week, fourth period.* Dr. Glass.

Credit 1 unit.

This course is primarily for dentists in the dental epidemiology and dental public health training programs. It includes review of current knowledge of the epidemiology of oral diseases and of methodologic problems in surveys and clinical trials in dental epidemiology.

The topics to be covered are dental caries, fluoridation, oral cancer, periodontal diseases, oral congenital malformations, indices of oral health, survey methodology, and design of clinical trials in oral diseases.

Epidemiology 300a,b,c,d,e. Tutorial Programs

Participation in departmental research in close association with a staff member. Time and credit are to be arranged with the Head of the Department.

Epidemiology 350. Research

In selecting topics for research in doctoral programs, students should consider the fields in which members of the Department are currently working. These include:

Neoplastic disease (Dr. MacMahon, Dr. Cole, Dr. Monson)

Congenital malformation (Dr. MacMahon, Dr. Miettinen, Dr. Yen)

Cardiovascular disease (Dr. Segall)

Statistical methods (Dr. Miettinen, Dr. Venezian)

Department of Health Services Administration

Alonzo S. Yerby, s.b., m.d., m.p.h., Professor of Health Services Administration, Head of the Department, *and* Director of the Interfaculty Program on Health and Medical Care

William J. Curran, s.b., j.d., ll.m., s.m. in hyg., Frances Glessner Lee Professor of Legal Medicine in the Faculty of Medicine and the Faculty of Public Health

Paul M. Densen, a.b., s.d., Professor of Community Health; *Director of The Center for Community Health and Medical Care, Harvard Medical School and Harvard School of Public Health.*

*Alfred L. Frechette, m.d., m.p.h., Clinical Professor of Public Health Practice; *Commissioner of Public Health, Commonwealth of Massachusetts*

†Sidney S. Lee, s.b., m.d., m.p.h., dr.p.h., Clinical Professor of Hospital and Medical Care Administration; *Associate Dean for Hospital Programs, Harvard Medical School*

Marjorie A. C. Young, s.b., ed.m., m.p.h., dr.p.h., Professor of Health Education

Alfred Yankauer, a.b., m.d., m.p.h., Senior Lecturer on Health Services Administration

Ralph E. Berry, Jr., a.b., a.m., ph.d., Associate Professor of Economics

Basil J. F. Mott, a.b., m.p.a., ph.d., Associate Professor of Health Services Administration

Jeanette J. Simmons, s.b., m.p.h., s.d. in hyg., Associate Professor of Health Education

Helen P. Cleary, a.b., m.p.h., s.d. in hyg., Lecturer on Health Education; *Associate Coordinator for Rhode Island Office, Tri-State Regional Medical Program*

*Jack Kasten, s.b., m.p.h., j.d., Lecturer on Health Services Administration; *Consultant, Arthur D. Little, Inc., Cambridge*

*Donald A. Kennedy, a.b., ph.d., Lecturer on Health Services Administration

*Joseph A. Yacovone, a.b., d.m.d., m.p.h., Lecturer on Dental Public Health; *Chief, Office of Comprehensive Health Planning, Rhode Island Department of Health*

* Part-time in the School of Public Health.
†Part-time in the School of Public Health, full-time in Harvard University.

R. Frances Grommers, s.b., m.d., m.p.h., Assistant Professor of Health Services Administration

Duncan Neuhauser, a.b., m.h.a., m.b.a., ph.d., Assistant Professor of Health Services Administration

Florence A. Wilson, a.b., m.d., Assistant Professor of Health Services Administration

*Marvin Durell, a.b., s.m., Visiting Lecturer on Health Services Administration; *Associate Director of Clinical Services, Beth Israel Hospital*

*William E. Hassan, Jr., s.b., s.m., ph.d., ll.b., Visiting Lecturer on Hospital Administration; *Director, Peter Bent Brigham Hospital*

*Edward B. Kovar, a.b., a.m., Visiting Lecturer on Community Health Planning; *Director, Health, Hospitals and Medical Care Division, United Community Services*

*Robert Morgan, a.b., m.p.h., Visiting Lecturer on Health Services Administration; *General Director, Dimock Community Health Center*

*Robert Morris, a.b., s.m., d.s.w., Lecturer on Social Planning; *Professor of Social Planning, The Florence Heller Graduate School for Advanced Studies in Social Welfare, Brandeis University*

*Beatrice F. Phillips, s.b., s.m., Visiting Lecturer on Health Services Administration; *Director, Social Service, Beth Israel Hospital*

*Henry Wechsler, a.b., a.m., ph.d., Lecturer on Social Psychology; *Research Director, The Medical Foundation, Inc.*

*David S. Weiner, a.b., m.p.h., Visiting Lecturer on Health Services Administration; *Assistant to the General Director, Children's Hospital Medical Center*

Louise N. Bell, a.b., m.p.a., s.m. in hyg., Teaching Fellow in Health Services Administration

Joel Kavet, s.b., m.p.h., Teaching Fellow in Health Services Administration

Hugh H. Tilson, a.b., m.d., m.p.h., Teaching Fellow in Health Services Administration

George B. Moseley, iii, s.b., m.b.a., j.d., Research Associate on Health Services Administration

The following members of other Harvard Faculties participate in teaching in the Department of Health Services Administration:

Leona Baumgartner, a.b., a.m., ph.d., m.d., *Visiting Professor of Social Medicine, Harvard Medical School*

James M. Dunning, a.b., d.d.s. m.p.h., *Professor and Head, Department of Ecological Dentistry, Harvard School of Dental Medicine*

Rashi Fein, A.B., PH.D., *Professor of the Economics of Medicine, Harvard Center for Community Health and Medical Care*

Osler L. Peterson, M.B., M.D., M.P.H., *Professor of Preventive Medicine, Harvard Medical School and Member of the Faculty of the School of Government*

Martin S. Feldstein, A.B., A.M., D.PHIL.OXON., *Professor of Economics, Faculty of Arts and Sciences*

Leonard W. Cronkhite, Jr., A.B., M.D., *Lecturer on Preventive Medicine, Harvard Medical School; General Director, Children's Hospital Medical Center*

Our contemporary health systems are in a dynamic state of change. Increasingly, health is considered to be a basic human right. Government is more and more being thrust into the health field, for the benefit of both the individual and the community. The increasing complexity of medical technology calls for diverse types of health organizations. This vast growth of organized health services has created an increased need for qualified administrators and researchers.

With the projection of the hospital into community health services and the health department into personal care services, a specialized field of health services administration is emerging. Leadership and research are required to ensure high quality service to both the individual and the community. Health professionals must do more than just provide service, they must be concerned with policy formation, administration, and research. One of the main goals of the Department of Health Services Administration is to provide this education for leadership in health service organizations. Emphasis is placed on planning, organization, delivery, and evaluation of health services. Efforts are made to adapt to the practical problems of providing health services, relevant theory and concepts from the social and behavioral sciences, including such fields as economics, law, political science, anthropology, sociology, and public and business administration. The Department is concerned with research designed to improve the methodology of measuring the effectiveness of health services and in the development and testing of models of health systems and sub-systems.

Emphasis is placed on macro-administration or the administration of health systems. Cross-national studies of health care systems are used as analytic tools to assist the student in gaining an appreciation of the universal nature of the determinants that govern organized activity for the delivery of health services.

Consideration is given to traditional administrative techniques as well as more recently developed quantitative and analytic methods. Since there are many problems, broad in scope, which must be studied, the resources of multiple disciplines and several Harvard faculties are carefully integrated into the program.

The program leads to the degree of Master of Science or Master of Public Health in the field of Health Services Administration. Candidates for this degree program will be expected to demonstrate competence in their own professional discipline and an understanding of quantitative methods and their application to the planning, administration and evaluation of health services. A minimum of four courses offered or approved by the Department will satisfy the requirements of this program. The remainder of the credits required for the degree may be taken as additional formal courses, tutorials or supervised research in areas of special interest to the candidate.

Master of Public Health degree candidates desiring to include health services administration among their required units of core courses may elect any one of the following courses: Health Services Administration 201a,b; Health Services Administration 203a,b; Health Services Administration 212c,d; or Health Services Administration 295c,d.

Qualified students interested in research training may seek admission to either of the doctoral programs offered by the School. During the first year of provisional doctoral candidacy, students are expected to enroll in advanced courses in health services administration and related fields. However, most of the training period beyond the master's degree is occupied by the completion of a research project and the preparation of a thesis. Doctoral candidates must plan at least two years in residence beyond completion of the master's degree.

A three-year residency in the Department of Health Services Administration has been approved as satisfying requirements of the American Board of Preventive Medicine for certification in General Preventive Medicine. Requirements of the approved residency and of the School's degree programs may be satisfied simultaneously.

Special purpose traineeships for master's degree candidates and research training fellowships for doctoral candidates are provided in the Department by the National Center for Health Services Research and the National Institutes of Health.

Since health services administration is fundamentally concerned with health manpower and its effective use in organizations and institutions, the Department maintains close liaison relationships with Harvard Medical School and with several Harvard University-affiliated hospitals. Thus, to the Harvard School of Public Health's expertise in community health, preventive medicine, and research are added the resources of medical education, university hospitals, and the discipline of hospital administration. The Department of Health Services Administration works in close cooperation with the Harvard Center for Community Health and Medical Care. Since the teaching of health services administration also involves training in business administration and economics, liaison relationships have been developed between the School and the Harvard School of Business Administration and the Department of Economics

of Harvard University. An important element of community health services training is provided by the mutually beneficial relationships with the Massachusetts Department of Public Health, the Boston City Department of Health and Hospitals, the Cambridge City Department of Health and Hospitals, and the Tri-State Regional Medical Program, the New York City Departments of Health and Hospitals, and the Department of Health of the Commonwealth of Puerto Rico.

Health Services Administration 201a,b. The Nature and Function of Health Care Delivery Systems

Lectures and discussions. *Two two-hour sessions each week, first and second period.* Dr. YERBY and Staff of the Department.

Credit 4 units.

This course may be taken as part of the core curriculum for Master of Public Health candidates.

This course consists of an analysis of health care systems and their component institutional forms as they have evolved as expressions of the felt needs of societies. There will be an examination and comparison of present-day health service arrangements in three nations (the Soviet Union, the United Kingdom, and the United States), as they reflect national goals and priorities and other constraints. This is followed by an analysis of the major determinants of health care systems including: consumer expectation and demand; health manpower; financing; technology; law; politics; and organization.

The underlying theme is health care systems, their evolution, their structure, how they are currently expressed in selected nations, and the universality of the forces that serve to shape and mold them.

Health Services Administration 202b,c,d. Departmental Seminar

Seminars. *One two-hour session each week, second, third and fourth periods.* Dr. YERBY and Staff of the Department.

Credit 3 units.

This course is for persons concentrating in the Department. It will be focused on current issues in health services administration.

Health Services Administration 203a,b. Administration and Organization of Health Services

Lectures and discussions. *Two two-hour sessions each week, first and second periods.* Dr. MOTT and Dr. NEUHAUSER.

Credit 4 units.

This course may be taken as part of the core curriculum for Master of Public Health candidates.

Analysis of the character and functions of the administrative process in

health agencies and facilities. The course will focus upon: organizational and environmental factors that shape and constrain the administrative process; decision-making and planning; techniques of administrative control (program planning, budgeting, personnel management, systems analysis, cost benefit and cost effectiveness analysis, etc.); problems of administrative control (conflicts between staff and line, organizational design, reorganization, centralization versus decentralization, etc.); and differences in administration among health organizations. Students will participate in a group field exercise in which they will prepare for an agency a program plan that takes account of actual community and organizational realities. Generally, following the lectures, the class will be divided into two discussion groups to be led by Drs. Mott and Neuhauser.

Health Services Administration 205a,b. Health Education

Seminars. *One two-hour session each week, first and second periods.* Dr. Young, Dr. Simmons and Dr. Cleary.

Credit 2 units.

This course emphasizes major aspects of learning theory, communication theory, educational methods, and health behavior; health education in the process of social change; psychosocial and cultural factors relevant to the planning of health education programs; and research and evaluation in health education. The major focus of the course is on health education aspects of community health programs, including school health services. Course will be repeated in c,d period if a sufficient number of students are enrolled.

Health Services Administration 206c,d. Health Law, Public Policy, and Consumer Protection in the Health Field

Seminars. *One two-hour session each week, third and fourth periods.* Dr. Curran

Credit 2 units.

This course is designed for students interested in the application of law and legislative process to the establishment of public policy in the health field in such areas as medical care delivery systems, health manpower, and health care organizations. It will examine regulatory programs in health areas, such as the Federal Trade Commission and the Food and Drug Administration, the use of legal actions to protect the consumers, and will measure for facilitating consumer involvement in decision-making in the health field.

The rights and legal protection of health providers, the health industry, and the food and drug industries will also be considered, particularly as related to matters of due process of law, hearings, and opportunity to present views fairly and effectively in the legislative and regulatory processes.

Students may also take advance work in selected areas of the above fields under the direction of Dr. Curran and his associates.

Health Services Administration 207a,b. Dental Public Health Practice

Seminars and field visits. *One two-hour session each week, first and second periods.* Dr. Dunning and Dr. Yacovone.

Credit 2 units.

This seminar course is designed for dentists and for those of other disciplines who desire training in depth in the administration and planning of dental health programs. All phases of dental public health are covered including dental needs, resources, surveying, dental health education, fluoridation, prepayment, and evaluation of programs. Reading assignments are used to stimulate class discussion. Each student develops a program plan in a specific area of community dental need and presents the plan to the class. Participants make field trips to several dental facilities. Students may elect to do advanced work in any phase of dental public health.

Health Services Administration 208a,b. The Economics of Health Services

Lectures and discussion. *Two one and one-half hour sessions each week, first and second periods.* Dr. Berry.

Credit 4 units.

This course is designed to provide an examination of the economic aspects of the production, distribution, and organization of health services. The basic approach in the course will be to provide an introduction to economic analysis and an application of that analytical framework to health services.

The first part of the course will deal with the determinants of supply and demand, the theory of markets, and the concept of economic efficiency. In effect, the course will offer a systematic introduction to micro-economic theory. The rest of the course will be devoted to applying the framework of economic analysis to the health services sector. Consideration will be given to the economic organization of medical care. The supply and demand of medical care facilities, the markets for physicians' services and other health manpower, the financing of medical care, and the role of government are among the topics considered during the course.

Each student is expected to prepare a term paper.

This course will normally be sufficient to prepare a student for HSA 208c,d and HSA 295a,b.

Health Services Administration 208c,d. The Economics of Health Planning

Lectures and discussion. *Two one and one-half hour sessions each week, third and fourth periods.* Dr. Berry.

Credit 4 units.

This course is designed for students who have a particular interest in the role of health planning in both developed and less developed nations. Planning is viewed as an alternative to the market as a mechanism for allocating scarce resources. The course provides the student with a brief introduction to the processes of economic development and economic growth. Topics considered include the determination of national income, economic development, economic growth, the role of the government, cost-benefit analysis, and economic planning. Examples of planning in a variety of national contexts including the Soviet Union, France, Great Britain, and the United States will be discussed. Problems of health planning and approaches to the integration of health planning and economic planning are discussed.

Each student is expected to prepare a term paper.

Prerequisite: HSA 208a,b or its equivalent is sufficient to prepare the student for this course.

Health Services Administration 210c,d. Computer-based Management and Planning Techniques

Seminars. *One two-hour session each week, third and fourth periods.* Dr. GROMMERS.

Credit 2 units.

This is an informal interdisciplinary seminar for students at the Schools and Departments associated in the Interfaculty Program, which include the Schools of Public Health, Medicine, Government, Business Administration, and the Department of Economics.

The course is concerned with the problems involved in innovations in health service systems of modern planning and management techniques, such as system analysis, decision theory, information systems, and automation. Examples will be presented with emphasis on *applicability* in the health field rather than mathematical techniques; interdependency of parts and their relation to the whole complex system and its objectives will be clarified.

Current uses of computers in health care systems will be discussed by active members of the field. There will be opportunity for guided practical experience with these techniques.

The objective of the course is to improve the basis for communication between technically and non-technically oriented professional members of the health care field. The course is designed to provide a basis for understanding the terminology and an appreciation of these techniques for administration and planning of health services. Mathematics background is not required.

Health Services Administration 211c,d. Administration of Personal Health Service Programs

Seminars and field projects. *One two-hour session each week, third and fourth periods.* Dr. KASTEN and Dr. WILSON.

Credit 2 units.

The course is designed for students who will be administrators of personal health service programs. Inpatient (general hospital, specialty hospital, and long-term care facility), ambulatory (private physician, group, hospital outpatient and emergency), home, multiple screening and rehabilitation programs are treated from an operational and preventive perspective. Special emphasis is placed on services for the chronically ill and/or aged and administrative problem solving. Students analyze administrative problems in operating personal care service programs.

Health Services Administration 212c,d. Policy and Practices in Medical Care Organization

Seminars. *One two-hour session each week, third and fourth periods.* Dr. Lee, Dr. Fein, and Dr. Yerby.

Credit 2 units.

This course may be taken as part of the core curriculum for Master of Public Health candidates.

This is an interdisciplinary course emphasizing analysis, planning, and decision-making in specific programs in medical care. The subjects covered include both governmental and voluntary programs; cost, utilization, structure and quality of services; and organizational and manpower problems in medical care programs. Case materials and selected readings are used.

Health Services Administration 213c,d. Politics and Organization of Health Planning

Seminars. *One two-hour session each week, third and fourth periods.* Dr. Mott.

Credit 2 units.

This course will describe and analyze the operating characteristics of the principal types of health planning agencies, such as comprehensive health planning agencies, and their capacity as organizational vehicles to attain desired objectives. The underlying objective is to consider how the effectiveness of planning agencies and planning personnel can be maximized. The course will focus upon the following topics: theories of community planning, community decision-making processes; the impact of community variables upon the operation of planning agencies; the effect upon the performance of planning agencies of their organizational characteristics; conditions and strategies for effective planning; and the prospects of health planning agencies.

Health Services Administration 214c,d. Methods for the Efficient Management of Health Services Organizations

Seminars. *One two-hour session each week, third and fourth periods.* Dr. Neuhauser.

Credit 3 units.

This course will discuss and describe how certain management (or administrative) methods and organizational characteristics may be used to improve the performance of health services facilities and agencies. The course will be based mainly upon empirical studies of hospitals from which principles of organization and management will be derived which are applicable to other health service organizations. The management methods include rules, budgets, and personnel practices. The organizational characteristics include size, complexity, turnover rate, occupancy, goals, and average length of stay.

The course is designed to be useful to students who have a general interest in management techniques as well as for those who are interested specifically in managing or planning health services facilities in particular hospitals. It would be helpful, but not essential that students have some prior preparation in administration and organization theory which may be obtained in HSA 203a,b.

A term paper will be required for which individual assistance will be provided.

Enrollment is subject to the approval of the Instructor.

Health Services Administration 215c. Administration of Ambulatory Care Programs

Seminars. *One two-hour session each week, third period.* Dr. Wilson.

Credit 1 unit.

This course deals with the concepts, problems and issues involved in administering ambulatory care programs. These will include organization, operations, professional and non-professional staffing, and the concept of the health care team. Comparative models such as neighborhood health centers and group practice will be discussed.

Prerequisite: Health Services Administration 201a,b, 203a,b or permission of the Instructor.

Health Services Administration 215d. Administration of Ambulatory Care Programs

Seminars and Tutorials. *One two-hour session each week, fourth period.* Dr. Wilson.

Credit 1 unit.

Continuation of Health Services Administration 215c for students with special interests.

Biostatistics and Health Services Administration 216c,d. Health Program Evaluation

Seminars and Tutorials. *One two-hour seminar in first week of third*

period; weekly tutorial group meetings for remainder of third period; one two-hour seminar each week, fourth period. Dr. Densen, Dr. Feldman, Mr. Frazier, Mrs. Jones, and Dr. Reed.

Credit 2.5 units.

This course is designed for students interested in the evaluation of ongoing health programs. After an introduction to the literature on evaluation methods, students are assigned to groups, each of which designs an evaluation proposal for a specific health program. During the fourth period seminars, these proposals are presented and critically analyzed by the students.

Health Services Administration 295a,b. Economics of Health Care Policy (Economics 2950a)

Seminars. *One two-hour session each week, first and second periods.* Dr. Berry and Dr. Feldstein.

Credit 3 units.

This is an advanced interdisciplinary course for doctoral candidates at the schools and departments associated in the Interfaculty Program — the Schools of Public Health, Medicine, the Kennedy School of Government, Business Administration, and the Department of Economics — and for students with advanced standing at the School of Public Health.

The course provides a survey of the basic economic issues of American health care policy. Seminar faculty and guest lecturers will present material on relevant topics including: The role of the market and government planning; health manpower; government insurance and financing programs; rising costs; the provision of urban medical services. HSA 208a,b or its equivalent will normally be sufficient to prepare students for this course.

Each student is expected to prepare a term paper.

Health Services Administration 295c,d. Economic and Administrative Issues in Medical Care (Economics 2950b)

Seminars. *One two-hour session each week, third and fourth periods.* Dr. Berry, and Dr. Peterson.

Credit 3 units.

This course may be taken as part of the core curriculum for Master of Public Health candidates.

This interdisciplinary course deals in detail with major issues in medical care and is designed for students from the Schools of Public Health, Medicine, Business Administration, the Kennedy School of Government, and the Department of Economics.

The organizational structure of the American Health Care System is reviewed systematically. Early seminars are devoted to the institutional forms prevalent in the health care sector. Issues relevant to hospitals, manpower

problems, medical education, and group practice are discussed. Alternative methods of financing medical care are considered as are such specific issues as the accessibility, cost, and quality of health care. There are seminars dealing with major problem areas including health services for the poor, health planning, and alternative methods of producing and delivering health services. In the later stages of the course there is an emphasis on health policy and policy making.

Each student is expected to prepare a term paper.

Health Services Administration 300a,b,c,d,e. Tutorial Programs.

Time and credit to be arranged.

Master's degree candidates may make arrangements to do individual and group work under the guidance of a staff member of the Department.

This work can include readings and special projects in such areas as dental health, medical care, and health education. In addition, field assignments to federal, state, and local government and private health organizations can be arranged.

301 *Field Work in Health Care Settings*, Dr. Kennedy.

A tutorial for students interested in study problems that require direct experience in operational settings. Each student will be expected to develop a study project and a field location will be selected in terms of its relevance to the study problem. Faculty members will be available for introduction to the field setting, for consultation, and for regulation tutorial discussion. The presence and participation of the student should have the potential for assisting the organization to resolve some meaningful problem.

A range of health care settings are available in the Boston area for this supervised fieldwork — hospitals (teaching, municipal, community), nursing homes, community health centers, private practice offices, municipal health departments, health planning agencies, health insurance organizations, legislative subcommittees concerned with health, state health agencies, medical school planning offices, district medical societies, and environmental health agencies.

The tutorial is available for either one-half or one full academic year. Credit will vary and be related to the time devoted to the project.

302 *Research in Health Education*, Dr. Wechsler, Dr. Young and Dr. Simmons

This tutorial aims to assist doctoral students and others interested in research methodology in health education to understand the elements of research design and to apply these elements in analyzing a number of research projects and in developing original research proposals. Special emphasis is given to evaluation research.

303 *Simulation Models.* Dr. Grommers.

Students interested in learning to design simulation models of various aspects of the health field and to run the models on high speed digital computers may elect this course in the second half of the academic year.

Health Services Administration 330e. Assignments to Field Agencies

One-week period between Fall and Spring Terms.

Credit 1 unit.

Students are assigned to work in the field on special projects, on group surveys or other types of field projects, or for observation of, and limited participation in, the work of health agencies.

Field assignments are made on an individual basis to meet the special needs of each student insofar as possible. Work in the field is coordinated with courses in the Department.

A field study of regionalized health services in Puerto Rico may be arranged in cooperation with the University of Puerto Rico School of Public Health. The work of the week is devoted to observation of the organization and function of peripheral, intermediate and central units of the health care systems in the North East Region of the Department of Health of the Commonwealth of Puerto Rico. The program includes a limited number of elective visits to other governmental health programs and to private or voluntary agencies or institutions.

Health Services Administration 350. Research

Doctoral candidates are offered the opportunity of undertaking individual study and research as the basis for a doctoral thesis.

The following courses, which are presented in Harvard Medical School, are open to properly qualified students in the School of Public Health.

Social Medicine HMS 706.0. Illness and Public Policy

Seminars. *One two-hour session each week, first, second, third and fourth periods.* Wednesdays, 4–6 p.m. Dr. Reiser, Dr. Ebert, Dr. Peterson, and Dr. Fiering.

Credit 4 units.

An interdisciplinary investigation of the institutions, social conditions, and values of American Society having major effects on national health, and the formulation of alternative policy strategies to deal with the problems uncovered. The seminar will examine particularly the effects that social, educational, and economic deprivation have upon illness and medical care, the scientific and societal causes of environmental pollution and the policies and

values which foster it, and the activities of the main governmental and private institutions concerned with national health problems.

History of Medicine HMS 701.0. Government and Health in America.

Seminars. *One two-hour session each week, third and fourth periods.* Mondays, 7–9 p.m. Dr. Reiser.

Credit 2 units.

An examination of the power and limitations of government in dealing with the health problems of the United States. The origins and development of the movement toward national health insurance in this country, culminating in the passage of the 1965 Medicare Bill, will be studied in detail, with comparisons made between the health system of the United States and the United Kingdom.

Preventive and Social Medicine HMS 715.0. Prepaid Health Care in the United States.

Lectures, discussions, and readings. *One two-hour session each week, second and third periods.* Wednesdays, 1:30–3:30 p.m. Mr. Pollack.

Credit 2 units.

A comprehensive examination of the prepayment and insurance of health care in the United States. Among the topics explored are: development and growth; legislative framework; corporate structure; benefit design and development; financing of protection; rate making; reimbursement for care; influences on utilization, cost, and quality of care; regulation of plans; private and public programs; expansion of coverage; extension of benefits; consumer, provider, and plan relationships; new forms; problems, issues, trends, and projections; proposals for national health insurance, appraisal.

Department of Maternal and Child Health

William M. Schmidt, s.b., m.d., a.m. (hon.), Professor of Maternal and Child Health *and* Head of the Department

Isabelle Valadian, m.d., m.p.h., Associate Professor of Maternal and Child Health

Johanna T. Dwyer, s.d., s.m., s.m. in hyg., s.d. in hyg., Assistant Professor of Nutrition and Maternal and Child Health

Helen D. Cohn, m.p.h., Lecturer on Public Health Nursing

Barbara Kohlsaat, a.b., a.m., a.m., Lecturer on Social Welfare

*Arthur J. Lesser, a.b., m.d., m.p.h., Visiting Lecturer on Maternal and Child Health; *Director, Maternal and Child Health Service, Health Services and Mental Health Administration, U.S. Department of Health, Education and Welfare*

*E. James Lieberman, a.b., m.d., m.p.h., Visiting Lecturer on Maternal and Child Health; *Assistant Clinical Professor of Psychiatry, Howard University*

*Antonio S. Medina, m.d., m.p.h., Visiting Lecturer on Maternal and Child Health; *Associate Professor and Director, Department of Human Development, University of Puerto Rico School of Public Health*

*Rowland L. Mindlin, s.b., m.d., m.p.h., Lecturer on Maternal and Child Health; *Director of Maternal and Child Health, Boston Department of Health and Hospitals*

*Robert Morris, a.b., s.m., d.s.w., Lecturer on Social Planning; *Professor of Social Planning, The Florence Heller Graduate School for Advanced Studies in Social Welfare, Brandeis University*

*Leon Sternfeld, s.b., m.d., ph.d., m.p.h., Visiting Lecturer on Maternal and Child Health; *Medical Director and Director of Research, United Cerebral Palsy Associations, New York City*

*James E. Teele, a.b., a.m., ph.d., Lecturer on Sociology; *Professor of Sociology, Department of Sociology and Anthropology, Boston University*

Ruth M. Butler, a.b., s.m., Research Associate in Social Work

Miriam C. Ekdahl, s.b., s.m. in s.s., Assistant in Social Work

The following individuals who hold appointments in Harvard Medical and Dental Schools participate in teaching in the Department of Maternal and Child Health

* Part-time in the School of Public Health.

Charles A. Janeway, A.B., M.D., A.M. (hon.), *Thomas Morgan Rotch Professor of Pediatrics*

Duncan E. Reid, S.B., M.D., A.M. (hon.), *William Lambert Richardson Professor of Obstetrics*

William Berenberg, A.B., M.D., *Clinical Professor of Pediatrics*

Thomas E. Cone, Jr., M.D., *Clinical Professor of Pediatrics*

Coenraad F. A. Moorrees, D.D.S., A.M. (hon.), *Professor of Orthodontics at the Forsyth Dental Infirmary for Children, Research Associate in Odontology*

Joel J. Alpert, A.B., M.D., Associate Professor of Pediatrics

John P. Connelly, S.B., M.D., *Associate Professor of Pediatrics at Massachusetts General Hospital; Executive Director, Bunker Hill Center of the Massachusetts General Hospital*

Howard N. Jacobson, M.D., *Associate Professor, Obstetrics and Gynecology at Boston Hospital for Women*

Robert B. Berg, A.B., M.D., *Assistant Professor of Pediatrics at Beth Israel Hospital*

Robert G. Rosenberg, M.D., *Instructor in Pediatrics at Children's Hospital; Director, Martha M. Eliot Health Center*

The Department of Maternal and Child Health is concerned with education and research in health services for mothers and children a.) as a part of general health services and b.) as they relate to other service systems (especially social services and education). The planning for the delivery of personal health, social, and family planning services to mothers and children depends upon knowledge of:

1. the aspirational values which society places upon them, their special vulnerability to biological and environmental hazards, and the successive phases of biological change (growth and development);

2. the social situation and the way in which social services function as they affect the health of children and influence the child-care capability of families;

3. the health aspects of centers of early childhood education, and traditional and innovative practices in elementary and high schools.

The courses and tutorial work offered by the Department are focused on actions which these characteristics demand for planning, administration,

and evaluation of health care services. Maternal and Child Health services, including services for handicapped children, at international, national, and local levels, are discussed in terms of integration with related health services in the community. In connection with this Departmental focus, the important roles of national governments, local health agencies, voluntary organizations, and community consumer groups are considered in seminars, observations of service programs in operation, or study of reports of such programs, foreign as well as domestic.

Fellowships are available for students who are concentrating in Maternal and Child Health.

Maternal and Child Health 202b. Comprehensive Maternal and Child Health Care

Seminars and field visits. *One two-hour session each week, second period.* Dr. VALADIAN and Staff of the Department.

Credit 1 unit.

Four field observations and four seminars. The field visits are to centers providing comprehensive care in the Metropolitan Boston area. The visits are followed by classroom sessions to discuss observed activities and relate them to Maternal and Child Health and Crippled Children's programs. Faculty members participate in all field visits.

Maternal and Child Health 203c,d. Programs in Maternal and Child Health

Seminars. *Two two-hour sessions each week, third and fourth periods.* Dr. SCHMIDT, Dr. VALADIAN, and Staff of the Department.

Credit 4 units.

The focus is on the health needs of families with children as these needs change with the age periods of childhood. Beginning with a block directed to planning for children, the successive segments of the course include maternity, early childhood, later childhood, and adolescence and youth. Seminars to discuss programs, legislative developments and research; faculty-accompanied field visits; and student presentations based upon assigned readings are used. These sessions trace health and social needs of mothers and children, and special issues in the organization of appropriate services for them.

Maternal and Child Health 204d. Welfare Programs and Their Relation to Health

Seminars. *One two-hour session each week, fourth period.* Staffs of the Departments of Maternal and Child Health and Health Services Administration.

Credit 1 unit.

Welfare and health services have a complementary relationship. More

often than not, however, this relationship, which should serve to protect and promote health, and well-being, fails to work well. Policy and practice seldom result in desired assurance of all needed services in a timely and harmonious manner. In this course concepts and attitudes relating to welfare are the subject of study. The purpose is to raise questions of public policy in relation to health and welfare. The content offered is designed to stimulate a point of view and to ascertain how personnel of both services may improve the operation of existing systems, and how needed changes in the structure of existing systems might be achieved.

Maternal and Child Health 205d. Research Approach to Growth, Development and Health of the Child

Seminars. *Two two-hour sessions each week, fourth period.* Dr. VALADIAN and Dr. REED.

Credit 2 units.

Methods of obtaining and evaluating data on child growth, development, and health, and the construction of norms. Problems involved in the study of interrelationships between various aspects of the child's progress and between the child and his background and environment.

Illustrative material from the Longitudinal Study of Child Health and Development conducted in this Department since 1930 by Dr. Harold C. Stuart, Professor *Emeritus*, as well as data from other studies in this country and abroad.

Enrollment is subject to the approval of the Instructor.

Maternal and Child Health 206c. Adolescence and Youth: Sociological Concepts Related to Health Care

Lectures and seminars. *One two-hour session each week, third period.* Dr. TEELE and Staff of the Department.

Credit 1 unit.

A multi-disciplined approach to adolescent and youth behavior in the United States with material on sociopsychological theories and research in the field. Review of social science research on socialization practices, adolescent culture, and adolescent problems, including health problems. The aim of the course is to introduce the student to the apparent social and health consequences for youth of earlier familial influences with respect to health care, health attitudes, and child-rearing practices. The relationship of the structure of society to the growth and development of children and youth is considered.

Maternal and Child Health 207b. Maternal and Child Nutrition

Lectures and discussions. *One two-hour session each week, second period.* Dr. DWYER.

Credit 1 unit.

Topics in nutrition which are important for an understanding of problems arising in work with mothers and children. At the end of the course, the student will be able to make his nutritional judgments based on the relevant scientific evidence on such questions as: optimum weight gain during pregnancy, effects of malnutrition on mental development, advisability of breast feeding and methods of teaching it if it is advisable, situations calling for restriction of sodium in pregnancy and best methods of doing so, factors influencing choice of infant diets and the handling of the introduction of solid foods, the treatment of feeding disorders, the types of government programs available for getting food or money for food to those who are at risk of poverty-induced malnutrition, the dietary treatment of children and adolescents with special nutritional problems such as obesity, pregnancy, and pica. Further, the student will have sufficient familiarity with special nutritional services for mothers and children and with the general background of paraprofessionals in this specialized field to enable him to make effective use of community resources in organizing and directing programs. Students will also prepare a special report of a topic of interest to them in the field.

Maternal and Child Health 300b,c,d,e. Tutorial Programs

Time to be arranged.

Credit 2 or more units.

Two types of tutorial programs are offered. One consists of work in an individual project under guidance; work is often based upon observation of health programs, study of health or vital records. A second type is based primarily upon directed reading and scheduled discussion with the appropriate faculty member; examples are: planning and evaluating health care services to mothers and children, technical assistance to developing countries in maternal and child health; the history, evolution, and future of school health. Similar tutorial programs are available in the developmental or social aspects of child health. Advance approval by the Head of the Department is required.

Maternal and Child Health 330. Field Studies

1. *One-week period between Fall and Spring terms.*

Credit 1 unit.

A field study in Puerto Rico is arranged in cooperation with the Department of Human Development of the University of Puerto Rico, School of Public Health. The full week is devoted mainly to observation of Maternal and Child Health activities, including programs for handicapped children and family planning services. Small groups travel to four different regions.

Consent of the Head of the Department is required for admission to this

course. *Enrollment must be made by the end of the first period.* (See page 197 for an estimate of the cost.) Preference is given to students whose special field of interest is Maternal and Child Health. Other students may enroll, to the limit of capacity.

2. Other field experiences may also be arranged for credit during the same week and at other periods of the year as time permits.

3. Students whose special field of interest is Maternal and Child Health and who do not have sufficient previous experience will be encouraged to have a period of field study before registration. Field study may also be undertaken after the completion of the academic year in a program arranged by the Staff of the Department. No credit.

Maternal and Child Health 350. Research

Doctoral degree students may undertake research in Maternal and Child Health by arrangement with the Head of the Department.

Leaving for an afternoon field study.

Department of Microbiology

ROGER L. NICHOLS, A.B., M.D., A.M. (hon.), Irene Heinz Given Professor of Microbiology, Head of the Department, *and* Associate Director of the Center for the Prevention of Infectious Diseases

CHARLOTTE C. CAMPBELL, S.B., Professor of Medical Mycology

EDWARD S. MURRAY, A.B., M.D., M.P.H., Professor of Microbiology

JOHN C. SNYDER, A.B., M.D., LL.D., Professor of Population and Public Health *and* Medical Director of the Center for Population Studies

*GEOFFREY EDSALL, M.D., Professor of Applied Microbiology; *Superintendent, State Laboratory Institute, Massachusetts Department of Public Health*

J. WILLIAM VINSON, S.B., S.D. IN HYG., Associate Professor of Microbiology

*CHARLES E. O. FRASER, B.V.SC., M.R.C.V.S., D.T.V.M., S.M., PH.D., Assistant Professor of Microbiology; *Microbiologist, New England Regional Primate Research Center*

A. BRUCE MACDONALD, A.B., PH.D., Assistant Professor of Microbiology

J. DENNIS MULL, A.B., M.D., M.P.H., Assistant Professor of Microbiology

*GEORGE F. GRADY, S.B., M.D., Lecturer on Applied Microbiology; *Director, Division of Biologic Laboratories, State Laboratory Institute, Massachusetts Department of Public Health*

*ROBERT B. PENNELL, S.B., S.M., PH.D., Visiting Lecturer on Immunology; *Director, Blood Research Institute, Inc.*

*MARTHA D. BERLINER, A.B., A.M., PH.D., Research Associate in Microbiology; *Associate Professor of Biology, Simmons College*

*KENNETH F. GIRARD, S.B., M.SC., PH.D., Research Associate in Microbiology; *Assistant Director, Division of Diagnostic Laboratories, State Laboratory Institute, Massachusetts Department of Public Health*

*FARROKH Z. MODABBER, A.B., PH.D., Research Associate in Microbiology

MARIE EBE RECA, DR.CHEM., Research Associate in Medical Mycology

*ROBERT E. OERTLEY, A.B., M.D., Field Project Administrator; *Assistant Chief, Ambulatory Health Services, Arabian American Oil Company*

MORRIS D. COOPER, A.B., S.M., PH.D., Research Fellow in Microbiology

NEIL S. ORENSTEIN, A.B., A.M., PH.D., Research Fellow in Microbiology

DONALD D. OURTH, A.B., A.M., PH.D., Research Fellow in Microbiology

* Part-time in the School of Public Health.

Ronald R. Watson, s.b., ph.d., Research Fellow in Immunology

*Leo Levine, s.b., Assistant in Microbiology; *Chief of Laboratory, Division of Biologic Laboratories, State Laboratory Institute, Massachusetts Department of Public Health*

Dorothy E. McComb, s.b., Assistant in Microbiology

*Teresa R. Rota, a.m., Assistant in Microbiology

*Judith M. Spielman, s.b., s.m. in hyg., Assistant in Microbiology

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Louis Weinstein, s.b., s.m., ph.d., m.d., *Lecturer on Infectious Diseases, Harvard Medical School; Professor of Medicine, Tufts University School of Medicine*

Ruth B. Kundsin, a.b., a.m., s.d. in hyg., *Research Associate in Bacteriology, Department of Surgery, Harvard Medical School; Associate Staff Member, Peter Bent Brigham Hospital*

Infectious diseases remain a major health problem, costing the United States billions of dollars each year; in underdeveloped countries these diseases impede progress. Microbiologists must now be concerned not only with prevention and treatment but with policy formation, administration and research if the problems of infectious disease, domestic and foreign, are to be solved. One of the goals of the Department of Microbiology, in conjunction with the Department of Tropical Public Health in the Center for Prevention of Infectious Diseases, is to provide this education for leadership in control of infectious diseases. Emphasis is placed on the decision making processes involved in diagnostic and surveillance programs; in judging the uses and limitations of public health systems, domestic and foreign, in the control of infectious disease; and in study of fundamental microbiological and immunological problems in infectious diseases of public health significance. The multifactorial causation of infectious diseases is emphasized in teaching and is related to the changing political, social and economic patterns in developed and underdeveloped countries which impinge upon the dynamics of the microbe-host relationship.

A major objective of the Department is to train students to think of infectious diseases in the context of epidemiology. Advances in immunology have extended the scope of inquiry required of microbiologists to autoimmune disorders, hypersensitivity phenomena, variations in host responses, cancer and immunological surveillance mechanisms.

Candidates for the degree of Master of Public Health or Master of Science in Microbiology must demonstrate competence in microbiology and immunology; they must understand the problems and opportunities in the control of infectious disease in developed as well as underdeveloped countries.

A minimum of four courses offered or approved by the Department will satisfy this requirement. The remainder of the credits required for the degree may be taken as additional formal courses, tutorials, or supervised research in areas of special interest to the candidate.

Qualified students interested in research training may be admitted to either the Doctor of Public Health or the Doctor of Science programs offered by the School in the Department of Microbiology. During the first year of a provisional doctoral candidacy, students are expected to enroll in advanced courses in microbiology, immunology and related fields in the School of Public Health, in the Harvard Medical School or in other areas of Harvard University or the Massachusetts Institute of Technology. Doctoral candidates must plan at least one year in residence beyond completion of the Master's degree. Most of the training beyond the Master's degree is occupied by completion of a research project and preparation of a thesis. Applied aspects of research are emphasized.

The Department maintains close liaison with Harvard Medical School and with several hospitals affiliated with Harvard University. Thus to the School of Public Health's interest and expertise in preventive and surveillance programs, community-wide or global in scope, are added the resources of medical education and university hospitals which emphasize the fundamental aspects of microbiology, immunology and the individual care of the patient.

Microbiology and Tropical Public Health 201a,b. Ecology and Epidemiology of Infectious Diseases

Lectures, seminars, and laboratory exercises. *Three one-hour sessions and one three-hour session each week, first period; one one-hour and two two-hour sessions each week, second period.* Dr. Weller, Dr. Nichols, and Staffs of the two Departments.

Credit 4 units.

Recommended as part of the core curriculum for Master of Public Health candidates.

This course is designed to provide an integrated presentation of information on communicable diseases of major public health importance. The exercises include discussions of the present status of infectious diseases in temperate and tropical climates, of procedures for their control at the community level, and of techniques available for study of microorganisms and parasites with special reference to recently developed methods which have opened a new era in microbiology. Coverage of etiologic agents includes the protozoa, helminths, viruses, rickettsiae, spirochetes, fungi, and bacteria. To achieve a comprehensive approach, subjects of public health importance and of diverse etiologies, such as the acute respiratory diseases, are considered in an integrated manner. Other important entities, such as malaria and

schistosomiasis, are selected for emphasis as case examples to illustrate epidemiological concepts and the elements of control.

The course assumes a medical school background and an understanding of the pathogenesis of disease produced by infectious agents in the affected individual. It is concerned primarily with the ecologic factors affecting transmission of infectious agents in the human community, with assessment of public health significance of representative infectious diseases, and with approaches to their prevention and control. In the laboratory, the student is not expected to acquire technological skills, but rather an understanding of the potentialities as well as of the limitations of pertinent public health laboratory procedures.

Microbiology and Tropical Public Health 202b. Current Research in Infectious Diseases

Seminars. *One two-hour session each week, second period.* Dr. CHERNIN, Dr. VINSON, and Staffs of the Departments of Microbiology and Tropical Public Health.

Credit 1 unit.

This course is required of all students concentrating in Microbiology or Tropical Public Health. Papers on topics of general interest are selected from current periodicals and critically reviewed as to soundness of experimental design, validity and significance of results and conclusions, organization of manuscripts and clarity of presentation.

Enrollment of nondepartmental students subject to approval of Instructor.

Microbiology 203d. Clinical Problems in Infectious Diseases

Lectures and clinics. Given at the New England Center Hospital. *One two-hour session each week, fourth period.* Dr. WEINSTEIN.

Credit 1 unit.

Problem cases concerning diagnosis, treatment and control of the common acute communicable diseases of temperate climates are presented, together with discussions of infectious diseases that are usually not considered communicable.

Microbiology 204c. Public Health and Laboratory Aspects of Infectious Diseases of Microbial Origin

Seminars and laboratory exercises. *Two three-hour sessions and one one-hour session each week, third period.* Dr. MURRAY and Staff of the Department.

Credit 2.5 units.

This course is for the epidemiologist as well as the microbiologist and is designed to complement Microbiology-Tropical Public Health 201a,b. It is

primarily concerned with laboratory procedures used in the diagnoses of diseases of viral, bacterial, chlamydial and mycotic origin.

Students do the laboratory procedures. Viruses and rickettsiae are isolated in cell cultures or in fertile eggs. Guinea pigs and mice are inoculated to study the characteristics of various viruses and chlamydia. Special media are used to identify the mycoses and mycoplasmatales. Students will perform in detail principal serologic and immunochemical technics such as complement fixation, neutralization, agglutination, immunofluorescence, chromatography, gel diffusion, immunoelectrophoresis and conjugation.

Seminar discussions center around the potentialities and limitations of the laboratory technics employed in both laboratory and field studies.

Enrollment is limited and subject to the approval of the Instructor.

Microbiology and Tropical Public Health 206d. Tuberculosis

Seminars. *One two-hour session each week, fourth period.* Professor Campbell, Dr. Morrow and Dr. Mack.

Credit 1 unit.

The purpose of this course is to provide an understanding of the ecology and the public health significance of tuberculosis which continues to be a worldwide problem of major importance. Various features of tuberculosis are discussed; particularly the microbiologic, medical, social, and economic aspects.

The significance of differentiating diseases often confused with tuberculosis, especially the respiratory mycoses and "atypical" mycobacterioses, is also considered. These discussions are based on selected reports in the literature and experiences of students and Faculty members in developed and developing nations with tuberculosis programs and control.

Visits to local tuberculosis hospital laboratories are arranged upon request.

Microbiology 207a. Fundamentals of Immunology

Lectures and laboratory exercises. *Three one-hour sessions and three two-hour laboratory sessions each week, first period.* Dr. MacDonald.

Credit 3.5 units.

The purpose of this course is to explore in depth fundamental immunochemical techniques and principles through active student participation in seminars, conferences, demonstrations and laboratory exercises. Although understanding of basic principles will be emphasized, special attention is given to the application and usefulness of immunochemical methodology in the study of various microbiologic and biologic phenomena.

This course is intended as a review of immunology in general, but particularly its relevance to public health. Although biochemical review, particularly of protein chemistry, is necessary, proficiency in biochemistry is not a pre-

requisite. Special attention will be given to immunochemistry, control mechanisms, and physical methods.

The laboratory sessions will consist primarily of the more recently developed techniques rather than the more classical type experiments. These techniques include isolation and alteration of antigens, hapten conjugation, radioimmunoelectrophoresis, immunoplaque assay, radioisotope labelling and analysis, isolation of antibodies, gel filtration, immunoadsorption, enzyme and chemical degradation of antibodies, isolation and characterization of immunoglobulins, and studies on hypersensitivity reactions.

The course is intended for students in the Master of Science and doctoral programs, but is open to all students interested in immunology.

Enrollment subject to the approval of the Instructor.

Microbiology 211b. Medical Mycology

Laboratory, conferences and field exercises. *One three-hour session and three hours of individual laboratory work each week, second period.* Professor CAMPBELL.

Credit 2 units.

This course introduces physicians and microbiologists to laboratory and field research and clinical studies in medical mycology. No prior knowledge of the mycoses is assumed. The course surveys pathogenic fungi and mycoses of medical and public health importance. It consists of conferences, workshops, laboratory and field studies under tutorial supervision. Procedures for isolating and identifying mycotic pathogens from a variety of clinical specimens and sources in nature are carried out in their entirety, including adjunctive technics. The role and interpretation of skin and serologic tests are considered in detail as they relate to individual cases and in the definition of geographic areas of high endemicity of the various respiratory mycoses.

In patients debilitated by severe disease or in surgical patients following organ transplantation, there has been a startling increase of devastating infections caused by otherwise innocuous yeasts and fungi; this is only one of the mycoimmunologic problems requiring extensive basic and applied research. Ecologic, epidemiologic and differential diagnostic points are illustrated and emphasized by studies of histories of proved individual cases or outbreaks of mycotic disease.

Enrollment is subject to the approval of the Instructor.

Microbiology 212c. Problems and Policies Involved in the Development and Use of Immunizing Agents

Seminars. *One two-hour session each week, third period.* Dr. EDSALL, Dr. GIRARD and Dr. GRADY.

Credit 1 unit.

This course deals with the scientific, medical, administrative and social problems involved in the development, preparation, evaluation and effective use of immunizing agents. It includes an examination of the principles under which immunizing agents are originated, several examples of their methods of preparation, a critique of the methods of evaluation of such preparations in the laboratory and in man, and current problems regarding reactions to immunization. It also takes up consideration of representative major issues currently at stake in the decision-making process regarding immunization programs. The course is designed primarily around contemporary material and problems facing the scientific or administrative health officer today.

Microbiology 213d. Intracellular Microorganisms Pathogenic for Man

Laboratory exercises and seminars. *Two three-hour sessions each week, fourth period.* Dr. Murray, Dr. Vinson and Dr. Fraser.

Credit 2 units.

This course consists of laboratory sessions and seminars which provide an understanding of the techniques available for study of the growth and the characteristics of representative strains of rickettsiae, bedsoniae, and viruses which are human pathogens. Each student performs the procedures for identification and characterization of unknown pathogens under supervision of the Staff.

Prerequisite: Microbiology 4c or equivalent.

Enrollment is limited to ten students with prior approval of the Instructor.

Microbiology and Tropical Public Health 214c,d. Case Studies in Epidemiology of Infectious Disease

Seminars and laboratory exercises. *One two-hour session each week, third and fourth periods.* Dr. Nichols, Dr. Mack and Dr. Morrow.

Credit 2 units.

This course is constructed to provide experience in solving epidemiologic problems in communicable disease. Actual epidemics of such disease entities as tuberculosis, hepatitis, arbovirus infections, and smallpox are solved on paper in classroom laboratory-type sessions with emphasis on a commitment by the participants at each stage of the solution.

Microbiology 215d. Problems in Medical Bacteriology

Seminars and laboratory demonstrations. *One three-hour session each week, fourth period.* Professor Campbell, Staff of the Department and Visiting Lecturers.

Credit 1 unit.

Bacteriologic problems of particular interest to students, which were not

considered in Microbiology-Tropical Public Health 201a,b, are discussed. The content of the course is assembled around the students' interests. Requests from at least six individuals are needed if the course is to be held; these should be submitted to the Instructor prior to the end of the second quarter.

Microbiology 300a,b,c,d. Tutorial Programs

Time and credit to be arranged. Staff of the Department.

Enrollment requires the consent of the staff member who is to be responsible for supervision of the research. The various subject areas are listed below by category.

301 *Pathogenic Fungi*, Professor CAMPBELL.

Biological, immunological and chemical characterization of the antigenic mosaic of *Histoplasma capsulatum* and other respiratory mycotic agents, involving electrophoretic and other recently developed immunologic procedures; serologic diagnosis of the respiratory mycoses including complement fixation, immunodiffusion and other serologic tests; basic studies on the agents, i.e., nutritional requirements, physiology, dimorphism, and morphogenesis.

Microorganisms available for study: an extensive collection of all pathogenic fungi, especially those producing systemic disease.

302 *Rickettsiae*, Dr. MURRAY and Dr. VINSON.

The qualified student may elect to study the biologic and immunologic characteristics of rickettsiae in the laboratory as well as to be associated with ongoing research in the field. Microorganisms under study in the Department include the rickettsiae of typhus fever, Rocky Mountain spotted fever, scrub typhus and trench fever. Biologic characteristics of these organisms are being studied in animals, chick embryos, and cell cultures. The IgG, IgM and IgA immunoglobulin response to these organisms are under investigation utilizing various immunochemical and serologic technics. Colonies of the human body louse and oriental rat flea are maintained in the laboratory for xenodiagnosis and transmission studies, and for studying host-parasite relationships and methods for control of anthropods. Rickettsial field projects are in progress in Yugoslavia, Tunisia, Mexico and Cape Cod, Massachusetts.

303 *Chlamydia*, Dr. MURRAY, Dr. NICHOLS and Dr. MACDONALD.

Laboratory and field research in trachoma, inclusion conjunctivitis, psittacosis, lymphogranuloma venereum and the diseases caused by the chlamydial agents in humans and animals constitutes an opportunity to solve problems in an interesting and unusual microbiological area. Students are welcome to do laboratory and occasionally field investigations.

304 *Viruses*, Dr. MURRAY.

Isolation and identification of representative viruses by use of tissue cultures, animal inoculation, and serologic techniques.

305 *Immunochemical Methods*, Dr. MacDonald.

Experiments with immunofluorescence, chromatography, immunoelectro phoresis, ultracentrifugation, labelled isotopes and other techniques are being applied to research on microorganisms and mechanisms of hypersensitivity.

306 *Public Health Laboratory*, Dr. Edsall and Associates at the State Laboratory Institute.

The State Laboratory Institute is engaged in a variety of procedures and studies related to public health programs. These include the development and testing of new serums and vaccines; the preparation, distribution and monitoring of the use of standards vaccines; research in various aspects of applied immunology; research, development and practical production of blood plasma fractions; various research possibilities related to a large diagnostic service in the fields of bacteriology, virology, the detection and study of congenital metabolic disorders; and field studies on the ecology of arboviruses. Individual arrangements for study can be made in any of these programs, depending on the student's needs, available time, and background.

307 *Sexually Transmitted Diseases*, Dr. Vinson.

The Department of Microbiology offers during the period between semesters a supervised study program on the sexually transmitted diseases. This program includes observation of cases of venereal disease in a local clinic; participation in sex contact tracing with venereal disease epidemiologists; familiarization with serologic tests for syphillis, including the treponemal fluorescent antibody test; and involvement in a research project dealing with isolation and characterization of "classic" and T strain *Mycoplasma* from cases of non-gonococcal urethritis.

Microbiology 350. Research

Qualified doctoral candidates, research fellows, and full-time special students may register for Microbiology 350 to undertake original research in virology, rickettsiology, mycology, bacteriology, immunology, or in one of the disciplines under study at the State Laboratory Institute. A number of the current research activities of the Department of Microbiology are indicated under Course 300. Inquiries as to specific research opportunities should be addressed to the Head of the Department.

Department of Nutrition

Fredrick J. Stare, s.b., s.m., ph.d., m.d., a.m. (hon.), s.d. (hon.), d.sc. (hon.), Professor of Nutrition *and* Head of the Department

Robert P. Geyer, s.b., s.m., ph.d., Professor of Nutrition

D. Mark Hegsted, s.b., s.m., ph.d., a.m. (hon.), Professor of Nutrition

Jean Mayer, b.a., b.sc., m.sc., ph.d., d.sc., a.m. (hon.), m.d. (hon.), Professor of Nutrition *and* Lecturer on the History of Public Health

*Harry N. Antoniades, b.s., ph.d., Associate Professor of Biochemistry; *Senior Investigator, Blood Research Institute, Inc.*

Stanley N. Gershoff, a.b., s.m., ph.d., Associate Professor of Nutrition

M. Guillermo Herrera-acena, a.b., m.d., Associate Professor of Medicine

George R. Kerr, m.d., c.m., Associate Professor of Nutrition

Bernard Lown, s.b., m.d., Associate Professor of Cardiology in Public Health

*Robert B. McGandy, a.b., m.d., m.p.h., Associate Professor of Nutrition

Carl C. Seltzer, a.b., ph.d., Senior Research Associate in Biological Anthropology

Francisco Cobos, m.d., Assistant Professor of Child Psychiatry

Phin Cohen, a.b., m.d., Assistant Professor of Nutrition

Johanna T. Dwyer, s.b., s.m., s.m. in hyg., s.d. in hyg., Assistant Professor of Nutrition and Maternal and Child Health

Kenneth C. Hayes, a.b., d.v.m., ph.d., Assistant Professor of Nutrition

Agnes M. Huber, b.sc., ph.d., Assistant Professor of Nutrition

Faissal Ard, m.d., m.p.h., Research Associate in Nutrition

*Hector A. Castellanos, b.s., m.d., Research Associate in Nutrition; *Professor of Biological Sciences, University of San Carlos, Medical School, Guatemala*

Niels E. Christiansen, a.b., a.m., ph.d., Research Associate in Sociology

Mohamed T. El Ghamry, b.sc., ph.d., Research Associate in Analytical Chemistry

Marjorie F. Elias, a.b., ed.m., ed.m., ed.d., Research Associate in Human Development

David L. Franklin, s.b., s.m., Research Associate in Systems Analysis

Michael D. Klein, a.b., m.d., Research Associate in Medicine

Bernard D. Kosowsky, a.b., m.d., Research Associate in Medicine

* Part-time in the School of Public Health.

*Joseph M. Miller, A.B., M.D., M.P.H., Research Associate in Medicine; *Senior Associate in Medicine, Peter Bent Brigham Hospital*

Anthony P. Polednak, A.B., A.M., PH.D., Research Associate in Biological Anthropology

*Patricia S. Remmell, S.B., S.M., Research Associate in Nutrition

*Donald W. Thomas, A.B., A.M., PH.D., Research Associate in Psychology; *Assistant Professor of Psychology, Simmons College*

*Carlos E. Vassaux, B.S., M.D., Research Associate in Medicine; *Senior Associate in Medicine, Roosevelt Hospital, Guatemala*

Richard L. Verrier, A.B., PH.D., Research Associate in Physiology

*Amnon Wachman, S.B., M.D., Research Associate in Medicine

Nelson P. Westmoreland, B.V.S., D.V.M., PH.D., Research Associate in Nutrition

Ezzat K. Amine, B.SC., S.M. IN HYG., S.D. IN NUTR., Research Fellow in Nutrition

Paul J. Axelrod, S.B., M.D., Research Fellow in Cardiology

Paul E. Araujo, S.B., S.M., PH.D., Research Fellow in Nutrition

Judith J. Ganchrow, A.B., S.M., PH.D., Research Fellow in Nutrition

Henry B. Garrison, S.B., M.A., M.D., Research Fellow in Nutrition

Vladimir M. Jelinek, M.B., B.S., M.D., M.R.A.C.P., Research Fellow in Cardiology

John F. Kroes, A.B., PH.D., Research Fellow in Nutrition

Ernest Lengle, A.B., PH.D., Research Fellow in Nutrition

Leif A. Lohrbauer, A.B., M.D., Research Fellow in Nutrition

Kenneth W. Samonds, S.B., S.M., PH.D., Research Fellow in Nutrition

Jonathan D. Satinsky, S.B., M.D., Research Fellow in Nutrition

Eduardo R. Seroppian, M.D., Research Fellow in Cardiology

Warren M. Strauss, A.B., M.D., Research Fellow in Cardiology

John V. Temte, S.B., PH.D., M.D., Research Fellow in Cardiology

Peter L. Thompson, M.B., B.S., M.R.A.C.P., Research Fellow in Nutrition

Dorothy Bruno, S.B., Assistant in Nutrition

Ethel J. Duffett, S.B., Assistant in Nutrition

Thomas P. Faherty, Assistant in Microscopy

Anna G. Gallagher, Assistant in Nutrition

Jelia C. Witschi, S.B., S.M., Assistant in Nutrition

James H. Shaw, B.A., S.M., PH.D., A.M. (hon.), *Professor of Nutrition, Harvard School of Dental Medicine*

Daniel S. Bernstein, A.B., M.D., *Associate Professor of Medicine, Harvard Medical School*

Ronald D. Hunt, s.b., d.v.m., *Principal Associate in Pathology, Harvard Medical School*

Evaline E. Schneeberger, a.b., m.d., *Assistant Professor of Pathology, Harvard Medical School*

The Department of Nutrition is concerned with basic and applied investigations in the science of nutrition in the areas of biochemistry, physiology, pathology, and psychology. Many of these are oriented toward problems of contemporary public health importance, such as cardiovascular diseases, obesity, and osteoporosis. The Department also has programs dealing with general nutritional and health problems in various countries in South America, Africa, and Asia.

In addition to the courses available in the School of Public Health, students may take graduate courses in the other Schools of Harvard University and at the Massachusetts Institute of Technology. Thus, a program leading to the Doctor of Science degree might include courses in nutrition, biochemistry, biostatistics and epidemiology, physiology, and bacteriology, as well as advanced courses in these and related fields, such as organic and physical chemistry and biology. Appropriate programs are available at the Doctoral level for individuals whose interests lie in community nutrition rather than in laboratory nutrition and biochemistry.

Candidates for the Master of Public Health degree who elect to concentrate in Nutrition are normally expected to take the following courses in addition to satisfying the formal course requirements for the degree:

Nutrition 201a and at least one other course offered by the Department of Nutrition.

Nutrition 201a. Public Health Nutrition

Lectures. *One two-hour session each week, first period.* Dr. Mayer, Dr. Gershoff, and Dr. McGandy.

Credit 1 unit.

Recommended as part of basic core curriculum for Master of Public Health candidates.

This course deals with nutrition and the application of nutrition programs to problems of human health in overnourished and undernourished populations of highly industrialized and developing areas of the world. Subjects to be discussed will include food and nutrition policy, obesity, atherosclerosis and coronary heart disease, malnutrition in the United States, methods for assessing nutritional status, and protein-calorie malnutrition.

Nutrition 202b,c,d. Departmental Seminar

Seminars. *Two one-hour sessions each week, second, third and fourth periods.* Dr. Huber and Staff of the Department.

Credit 3 units.

Students are expected to summarize and criticize recent publications on assigned topics in nutrition. Attention is placed on validity of experimental designs in nutritional research. Topics include the biochemical, physiological, psychological, and sociological aspects of nutrition.

Nutrition 203b,c,d. Advanced Topics in Nutrition

Lectures, discussions and required reading. *One two-hour session each week, second, third and fourth periods. Additional time to be arranged.* Dr. Hegsted, Dr. Mayer, Dr. Gershoff, Dr. Geyer, Dr. Hayes, and Dr. Huber.

Credit 3 units.

The nutritional aspects of metabolism of carbohydrates, fats, proteins, vitamins, and essential minerals are considered in detail. Mechanisms of regulation and behavioral aspects of food and fluid intake, calorimetry, genetic factors in nutrition, comparative requirements of various species are examined.

This course is intended primarily for students majoring in nutrition but can be taken by other adequately prepared students by the consent of the Instructors.

Nutrition 204a,b. Laboratory and Animal Techniques

Lectures and demonstrations. *One two-hour session each week, first and second periods with additional hours to be arranged.* Dr. Geyer and Dr. Antoniades.

Credit 2 units. Additional credits will be given for extra laboratory instruction.

This course is a survey of methods pertinent to laboratory research and animal techniques. The material covered includes biophysical and chemical techniques. Students participate in laboratory exercises on such general topics as chromatography, spectroscopy, microbiological assay, manometric measurements, and purified diet techniques. They are then instructed in the actual laboratory procedure pertaining to these techniques.

Prerequisite: A basic course in biochemistry.

Enrollment is subject to the approval of the Instructor.

Nutrition 205d. Nutritional Surveys

Lectures, discussions and laboratory exercises. *One two-hour session each week, fourth period.* Dr. Gershoff and Dr. McGandy.

Credit 1 unit.

Methods of obtaining dietary information, principles of nutritional surveys; assessment of nutritional status in public health programs and clinical research are examined and discussed. Laboratory work consists of practical exercises in evaluating diets and surveys.

Nutrition 206c,d. Nutritional Aspects of Human Disease

Lectures, discussions and demonstrations. *One two-hour session each week, third and fourth periods.* Dr. Herrera-Acena, Dr. Lown, Dr. Cohen, and Dr. Hayes.

Credit 2 units.

The first term deals with current concepts of atherosclerosis including the pathogenesis of this vascular disease, its associated risk factors, clinical and biochemical assessment of lipid metabolism, its relationship to sudden death and myocardial infarction, and its manipulation or prevention by diet and exercise. The second term considers specific aspects of nutrition and disease, and has included discussions of diabetes mellitus, anemias, cystic fibrosis, kwashiorkor, diseases of the liver and kidney, and metabolic bone disease.

Maternal and Child Health 207b. Maternal and Child Nutrition

Lectures and discussions. *One two-hour session each week, second period.* Dr. Dwyer.

Credit 1 unit.

Topics in nutrition important for an understanding of problems arising in work with mothers and children. At the end of the course, the student will be able to make his nutritional judgments based on the relevant scientific evidence on such questions as: optimum weight gain during pregnancy, effects of malnutrition on mental development, advisability of breast feeding and methods of teaching it if it is advisable, situations calling for restriction of sodium in pregnancy and best methods of doing so, factors influencing choice of infant diets and the handling of the introduction of solid foods, the treatment of feeding disorders, the types of government programs available for getting food or money for food to those who are at risk of poverty-induced malnutrition, the dietary treatment of children and adolescents with special nutritional problems such as obesity, pregnancy, and pica. Further, the student will have sufficient familiarity with special nutritional services for mothers and children and with the general background of paraprofessionals in this specialized field to enable him to make effective use of community resources in organizing and directing programs. Students will also prepare a special report of a topic of interest to them in the field.

Nutrition 208b. International Nutrition Policy and Programs

Seminars and discussions. *One two-hour session each week, second period.* Dr. Gershoff and Dr. McGandy.

Credit 1 unit.

This course is designed to cover food and nutrition policy in developing countries. The planning, execution, and evaluation of applied nutrition pro-

grams will be described. The need for coordination of efforts by the various government ministries or departments, including those of agriculture, education, economics, health and community development, will be stressed. The course includes discussion of such topics as the place of food and nutrition programs in relation to economic development; education and training in nutrition; the importance of social and cultural factors; methods of increasing the use of protein-rich foods; the role of FAO, WHO, UNICEF, and the voluntary agencies; action in case of famine; research and investigation as a tool for preventive action; the place of nutrition rehabilitation centers and MCH services; and the integration of nutrition with other projects of disease control in tropical areas.

Nutrition 300a,b,c,d,e. Tutorial Programs

Time and credit to be arranged.

Individual work, under direction, may be arranged for students at the master's level. This may include laboratory studies or projects in applied nutrition.

Nutrition 350. Research

Time and credit to be arranged.

Facilities are available for students at the doctoral level to do advanced work in nutrition along the lines of fundamental research or applied nutrition in public health and medicine. Areas currently receiving intensive and comprehensive study in the Department are as follows:

The effect of nutrition and other environmental factors on the etiology of heart disease in man; nutrition education; fluoride in human nutrition as a preventive for tooth decay and osteoporosis; cooperative international researches in nutrition. (Dr. STARE)

The nutritive value of proteins and protein requirements; dietary effects on the metabolism of cholesterol in animals and man; the influence of diet on the metabolism of adipose tissue; nutritional requirements for calcium and for bone formation. (Dr. HEGSTED)

Neurophysiological, behavioral, and metabolic aspects of the regulation of food intake in animals; experimental obesity; anthropological, metabolic, and behavioral studies of obesity in children and adolescents; psychological aspects of nutrition in man. (Dr. MAYER)

Lipid metabolism in tissue culture cells; polyvalent metal metabolism in soft tissue; effects of CO_2 deprivation on tissue culture cells, parenteral nutrition and artificial blood substitutes. (Dr. GEYER)

The effects of nutritional deficiencies on endocrine metabolism; the etiology of urolithiasis in experimental animals and man; vitamin metabolism; interrelationships between nutrition and endocrine function. (Dr. GERSHOFF)

Coronary artery disease; etiology of sudden death; derangements of the heart beat; exercise physiology; electrolyte metabolism. (Dr. Lown)

Protein isolation and characterization; hormone biochemistry and metabolism. (Dr. Antoniades)

Endocrine, nutritional, and metabolic aspects of diabetes and hyperlipidemia (Dr. Herrera-Acena)

Mental development and learning capacity as affected by malnutrition. (Dr. Cobos. In Bogota, Colombia)

Lipid metabolism in human platelets; energy substrate metabolism related to the problem of platelet preservation. (Dr. Cohen)

Investigation of certain physiological, psychological, and cultural factors affecting obesity, dieting, and weight control efforts, relationships between nutrition knowledge and various groups and their eating practices; evaluation of the effectiveness of nutrition education; evaluation of feeding programs. (Dr. Dwyer)

Nutritional pathology and the fat-soluble vitamins with specific interest in lipid metabolism, atherosclerosis, and metabolic bone disease. (Dr. Hayes)

Zinc metabolism. (Dr. Huber)

Primatology, particularly nutrition as it relates to fetal development. (Dr. Kerr)

Admission is limited and is subject to the approval of the Instructor.

Department of Physiology

James L. Whittenberger, s.b., m.d., a.m., (hon.), James Stevens Simmons Professor of Public Health, Professor of Physiology *and* Head of the Department

†Benjamin G. Ferris, Jr., a.b., m.d., Professor of Environmental Health and Safety; *Director of Environmental Health and Safety, University Health Services*

*Ross A. McFarland, a.b., ph.d., s.d. (hon.), Daniel and Florence Guggenheim Professor of Aerospace Health and Safety

Jere Mead, s.b., m.d., Professor of Physiology

Mary O. Amdur, s.b., ph.d., Associate Professor of Toxicology

John B. Little, a.b., m.d., Associate Professor of Radiobiology

Sheldon D. Murphy, s.b., ph.d., Associate Professor of Toxicology

John M. Peters, s.b., m.d., m.p.h., s.d. in hyg., Associate Professor of Occupational Medicine

Joseph D. Brain, a.b., s.m., s.m. in hyg., s.d. in hyg., Assistant Professor of Physiology

Stanley V. Dawson, s.b., s.m., s.d. in hyg., Assistant Professor of Environmental Health Engineering

John D. Dougherty, a.b., m.d., m.p.h., s.d. in hyg., Assistant Professor of Environmental Health and Safety

Philip I. Hershberg, b.e.e., m.e.e., m.d., Assistant Professor of Medicine

Frederic G. Hoppin, Jr., a.b., m.d., Assistant Professor of Physiology

David E. Leith, a.b., m.d., Assistant Professor of Physiology

*Raymond L. H. Murphy, Jr., s.b., m.d., m.p.h., s.d. in hyg., Assistant Clinical Professor of Occupational Medicine; *Research Associate, Massachusetts Institute of Technology*

Ronald M. Pickett, a.b., a.m., ph.d., Assistant Professor of Experimental Psychophysiology

Sergei P. Sorokin, a.b., m.d., Assistant Professor of Anatomy

Howard W. Stoudt, a.b., a.m., ph.d., s.m. in hyg., Assistant Professor of Physical Anthropology

Dwight W. Underhill, b.e., s.m. in hyg., s.d. in hyg., Assistant Professor of Environmental Health Engineering

* Part-time in the School of Public Health.
† Part-time in the School of Public Health, full-time in Harvard University.

*Charles A. Berry, A.B., M.D., M.P.H., Visiting Lecturer on Aerospace Medicine; *Director of Medical Research and Operations, NASA Manned Spacecraft Center*

*Hervey B. Elkins, A.B., PH.D., Visiting Lecturer on Industrial Toxicology; *Director, Massachusetts Division of Occupational Hygiene*

*David W. Fassett, A.B., M.D., Visiting Lecturer on Occupational Medicine; *Director, Laboratory of Industrial Medicine, Eastman Kodak Company*

*Harry Heimann, S.B., M.D., Visiting Lecturer on Occupational Medicine; *Research Professor of Community Medicine (Environmental Medicine), Mt. Sinai School of Medicine, New York*

Steven D. Cohen, S.B., S.M., S.D. in HYG., Research Associate in Toxicology

Thomas J. Crowley, S.B., S.M., Research Associate in Environmental Health and Safety

Rudolph J. Jaeger, S.B., PH.D., Research Associate in Toxicology

*John M. Tyler, A.B., M.D., Research Associate in Physiology; *Chief of Professional Services, Lemuel Shattuck Hospital*

*William H. Forbes, A.B., A.M., DR.PHIL., M.D., Consultant on Physiology

David M. Travis, A.B., M.D., Senior Research Fellow in Physiology

Malcolm Green, B.A., B.SC., B.M., B.CH., M.A., M.R.C.P., Research Fellow in Physiology

Franklin E. Mirer, A.B., A.M., PH.D., Research Fellow in Toxicology

Ruth B. Cherry, A.B., A.M., Assistant in Physiology

Anthony J. Morandi, A.B., A.M., Assistant in Psychophysiology

Helene Vetrovs, Assistant in Radiobiology

Robert G. Monroe, A.B., M.D., *Associate Professor of Pediatrics, Harvard Medical School*

Frank E. Speizer, A.B., M.D., *Assistant Professor of Medicine, Harvard Medical School*

Mary Ellen Beck Wohl, M.D., *Assistant Professor of Pediatrics, Harvard Medical School*

The Department of Physiology has interests which include physiology as a basic medical science. The Department's concerns, however, extend beyond pure physiology to encompass a broad spectrum of environmental health problems for which physiologic and biochemical knowledge and techniques are necessary tools. The biologic effects of air pollutants, of pesticides, and of radiation are typical problems that have been central to the Department's interests. Such broad problems require the insights of many specialties and the personnel of the Department reflect this multi-disciplinary approach.

The staff of the Department includes physicians, physiologists, psychologists, physical anthropologists, health and safety specialists, engineers, toxicologists, and specialists in radiobiology, occupational and aerospace medicine. Students and Research Fellows come with similarly varied backgrounds.

A major objective of the Department is to provide students with basic information on the relationship of man to his physical and chemical environment. The course Environmental Health Interdepartmental 201a, 201b introduces M.P.H. candidates to fundamental concepts regarding the measurement of both the quality of the environment and its impact on man. These concepts are examined in detail in specialized courses such as Environmental Physiology, Principles of Toxicology, Radiation Biology, and Human Factors in Occupational Performance and Safety. Specific research projects of members of the Department offer students an opportunity to gain experience in, and to develop a capacity for, critical evaluation of research methods. Qualified individuals may enroll in a program leading to a doctoral degree.

The research programs include topics such as cellular effects of ionizing radiation, mechanisms of carcinogenesis and mutagenesis, toxic interactions of particles and vapors, inhalation toxicology, pesticide metabolism and toxicity, enzyme induction, comparative respiratory physiology, and the deposition and clearance of particles in the respiratory tract. Other research areas are the elastic properties of the lungs and chest wall, mechanisms of flow limitation, role of lung surfactant, human factors in transportation safety, causation of chronic non-specific respiratory disease, exercise and work physiology and factors involved in fitting the machine and work environment to the capabilities of human performance.

Physiology 203a,b. Human Physiology

Lectures and conferences. *Two two-hour sessions each week, first and second periods.*

Laboratory and demonstrations. *One two-hour session each week, first and second periods.* Dr. Brain and Staff of the Department.

Credit 5 units.

This course presents basic physiological processes which characterize living cells, organs, organ systems, and whole organisms as they respond to a changing environment. Topics covered include cell structure and physiology, genetics, circulation, gas exchange, endocrinology, neurophysiology, fluid and solute exchange, and general pathology. The laboratory work and demonstrations will be correlated with the lectures and are intended to give students some experience with the problems and satisfactions of observing living systems.

Prerequisites: College courses in physics, chemistry, and mathematics, or permission of the Instructor. This course is suitable for students who lack a background in physiology or biology.

Physiology 204c. Environmental Physiology

Lectures and conferences. *One two-hour session each week, third period.* Dr. Leith and Staff of the Department.

Credit 1 unit.

This course deals with fundamental principles in the relations between organisms and their physical, chemical, and biological environments. Response, adaptation, performance, and tolerance limits are considered. Application of these principles in man's affairs is discussed in the fields of exercise, altitude and diving, high and low temperatures, and humidity.

Prerequisite: Master of Science candidates who wish to take this course must have had Physiology 203a,b or the equivalent.

Physiology 205c, 205d. Principles of Toxicology

Lectures and laboratory demonstrations. *Two two-hour sessions each week, third and fourth periods.* Dr. Amdur and Dr. Murphy.

Credit 5 units.

This course deals with the toxic effects of exposure of living organisms to foreign chemicals. The first period includes discussions of the history and basic principles of experimental toxicology, the methods used in toxicologic research and safety evaluation studies and the biochemical and physiologic response of tissues, organ systems, and intact animals to toxic chemicals. Two or three laboratory sessions are included.

During the second period emphasis will be placed on the practical applications and implications of information derived from experimental toxicology for problem areas in public health. These will include the use of toxicologic information by regulatory agencies and discussion of toxicologic information on pesticides, air and water contaminants, industrial chemicals, drugs, food additives, and natural products. The orientation will be toward the usefulness of existing data and the need for further toxicologic research.

The entire course is required of students majoring in toxicology and should be of value to other students who expect to be involved in research or administration that may include some aspects of toxicology. The "d" period may be taken separately by students with a bio-medical background who are primarily concerned with the application of toxicologic information to practical public health problems.

Prerequisites: College chemistry and biology courses, Physiology 203a,b or permission of the Instructors.

Physiology 207c,d. Radiation Biology

Lectures. *Three one-hour sessions each week, third and fourth periods.*

Laboratory. *One two-hour session each week, third and fourth periods.* Dr. Little.

Credit 5 units.

This course deals with the biological effects of ionizing radiation and is divided into two parts, cellular and mammalian radiation biology. Included in the first will be a discussion of elementary target theory, radiation chemistry, effects on macromolecules, cellular and chromosomal effects, and recovery processes. The second part covers the acute and long-term effects of radiation with emphasis on man, as well as a discussion of environmental sources of radiation and the characteristics of internal and external human exposure.

Prerequisite: Physiology 203a,b, or equivalent. The lectures (3 credit units) may be taken without the laboratory with consent of the Instructor. The laboratory will not be offered for less than 5 students.

Physiology 208a,b. Seminar in Toxicology

Lectures and seminars. *One two-hour session each week, first and second periods.* Dr. Murphy and Dr. Amdur.

Credit 2 units.

The purpose of this course is to acquaint students with current problems in toxicologic research and to stimulate in-depth discussion of mechanisms of action and metabolism of toxic chemicals. Following a series of introductory lectures on problems in toxicology, students will be expected to review the literature on an assigned topic in basic toxicologic research and to present a critical summary for class discussion. Broad topic areas will include metabolism of toxic chemicals, target sites and mechanisms of toxic action, structure-activity relationships, toxicologic interactions and functional-morphological relationships. Two or three hours per week of outside reading will be required. Consent of the Instructor is required.

Physiology 300. Tutorial Programs

Time and credit to be arranged.

Opportunities are provided for tutorial work at a master's degree level in the fields of respiratory physiology, toxicology, occupational medicine, and radiobiology.

Physiology 350. Research

Doctoral candidates and other properly qualified students may undertake laboratory or field research by arrangement with the Head of the Department.

Natural Sciences 133. The Human Organism

This course, which is presented in Harvard College, is open to properly qualified students in the School of Public Health.

Half course (*spring term*). *M., W., and F. at 10, and six two-hour section meetings at hours to be arranged.* Dr. Brain and Staff of the Physiology Department.

An introduction to the physiological aspects of human birth, life, disease, and death and a consideration of major issues in the causes, diagnosis, treatment, and prevention of disease. This course includes a survey of basic physiological processes which characterize human cells, organs, organ systems, and organisms as they respond to a changing environment. Topics include cell structure and physiology, genetics, circulation, gas exchange, endocrinology, neurophysiology, fluid and solute exchange, embryology, and general pathology. Cancer, aging, and infectious disease as well as the diagosis and treatment of disease are also introduced.

Note: Fulfills one half of the basic General Education requirement in Natural Sciences.

Prerequisites: At least a high school course in biology; high school physics and chemistry and a previous college-level science course is strongly recommended.

Department of Population Sciences

Hilton A. Salhanick, A.B., A.M., PH.D., M.D., Frederick Lee Hisaw Professor of Reproductive Physiology *and* Head of the Department; *Professor of Obstetrics and Gynecology, Harvard Medical School*

John C. Snyder, A.B., M.D., LL.D., Professor of Population and Public Health *and* Medical Director, Center for Population Studies

*Joseph D. Beasley, A.B., M.D., D.T.M.&H., M.P.H., Visiting Professor of Population and Public Health; *Chairman, Department of Family Health and Population Dynamics, Tulane University, Louisiana*

Arthur J. Dyck, A.B., A.M., PH.D., Mary B. Saltonstall Professor of Population Ethics; Member of the Center for Population Studies; *Member of the Faculty of the Harvard Divinity School*

Roy O. Greep, S.B., S.M., PH.D., A.M. (hon.) S.D. (hon.), John Rock Professor of Population Studies; *Director of the Laboratory of Human Reproduction and Reproductive Biology, Harvard Medical School*

Roger Revelle, A.B., PH.D., S.D. (hon.), A.M. (hon.), L.H.D., Richard Saltonstall Professor of Population Policy and Director of the Center for Population Studies.

Harold A. Thomas, Jr., S.B., S.M., S.D., Gordon McKay Professor of Civil and Sanitary Engineering

David M. Heer, A.B., A.M., PH.D., Associate Professor of Demography

John B. Wyon, B.A., M.B., B.CH., M.P.H., Senior Research Associate and Lecturer on Population Studies

Stephen J Plank, PH.B., A.B., M.D., M.P.H., DR.P.H., Lecturer on Population Studies

E. Noel McIntosh, S.B., M.D., S.M. IN HYG., Assistant Professor of Population Sciences; *Director of Population Sciences, Boston Hospital for Women*

Charles Neave, A.B., M.D., M.P.H., DR.P.H., Assistant Professor of Population *Studies* (Absent 1971–72)

Henry W. Vaillant, A.B., M.D., S.M. IN HYG., Assistant Professor of Population Studies (Absent 1971–72)

*Joel E. Cohen, A.B., A.M., PH.D., M.P.H., Lecturer on Population Sciences; *Assistant Professor of Biology, Harvard University*

* Part time in the School of Public Health.

HELEN GIDEON, M.B., B.S., M.P.H., Research Associate in Population Studies

*RODRIGO GUERRERO, M.D., S.M. IN HYG., DR.P.H., Instructor in Population Sciences; *Assistant Director, Fundación H. Carvajal, and Auxiliary Professor, Faculty of Medicine, Department of Preventive Medicine, University of Valle, Colombia*

*GRETCHEN M. BERGGREN, A.B., M.D., S.M. IN HYG., Research Associate in Population Sciences; *Assistant to the Director, Community Health Program, Hôpital Albert Schweitzer, Haiti*

VYTAUTAS I. UZGIRIS, A.B., S.B., M.D., PH.D., Research Associate in Population Studies

CARMEN A. WHIPPLE, B.S., M.A., PH.D., Research Associate in Population Studies

*DAVID CHARLES, M.B., B.S., Consultant on Human Reproduction; *Professor and Chairman, Department of Obstetrics and Gynecology, Boston University School of Medicine; Lecturer on Obstetrics and Gynecology, Harvard Medical School*

*RICHARD B. GAMBLE, A.B., A.M., Consultant on Population Problems; *Executive Director, The Pathfinder Fund.*

*ALFREDO GOLDSMITH, M.D., M.P.H., Consultant on Population Problems; *Medical Director, The Pathfinder Fund.*

*JACK M. GOLDSTEIN, A.B., S.B., S.M., PH.D., Consultant on Instrumentation; *Staff Scientist, Fisher Research Laboratories*

*DUNCAN E. REID, S.B., M.D., A.M. (hon.), Consultant on Human Reproduction; *William Lambert Richardson Professor of Obstetrics, Harvard Medical School*

CLAYTON L. THOMAS, S.B., M.D., M.P.H., Consultant on Human Reproduction; *Vice President of Medical Affairs, Tampax, Incorporated*

JULIAN M. STRAUSS, S.B., D.V.M., M.P.H., *Research Fellow in Population Sciences*

The advances of the past century in science, technology, and economic development have revealed unprecedented opportunities for improving the quality of life for much of mankind. Among these opportunities are several in the field of public health which have been the basis for large-scale programs aimed at prevention and control of major diseases, such as malaria and smallpox. But the striking successes in reducing morbidity and mortality from epidemic diseases have not been consistently accompanied by improvement in the conditions of life. Rapid expansion of population in many parts of the world is thwarting the current efforts to provide better housing, education, nutrition, health services and medical care. The disparity between rates of population increase and rates of development of human and economic resources is a crucial problem confronting society.

Acting under the conviction that the health professions can and should participate in general efforts to improve the quality of human life, the School

of Public Health established the Department of Demography and Human Ecology in 1962 (renamed the Department of Population Sciences in 1969) and the Center for Population Studies in 1964.

The formal courses and the tutorial instruction of the Department are planned to prepare students for effective participation in population programs as administrators, research workers, or educators. The Department has developed courses of instruction in the biological and social processes which influence population change, in the means available to control human fertility, and in the physiology of reproduction.

The courses of instruction listed below are those intended primarily for students enrolled in the School of Public Health, but may be elected by students in other parts of Harvard or by other qualified persons who fulfil the criteria for admission as special students.

Candidates for the degree of Master of Science in Population Sciences should direct inquiries concerning their programs to the Head of the Department.

Candidates for the Master of Public Health degree who elect to concentrate in Population Sciences are normally expected to take the following courses in addition to the general course requirements:

Population Sciences 202b,c,d.
Population Sciences 203c
Population Sciences 204c,d
Population Sciences 205c,d
Population Sciences 330e

Population Sciences 192a,b. Problems of Population (Sociology 192)

Lectures. *Three one-hour sessions each week, first and second periods.* Dr. Heer.

Credit 4 units.

This course reviews the history of the world's population and the social consequences of different population sizes and growth rates. Special attention is paid to a cross-cultural analysis of the social determinants of fertility, mortality and migration.

A term paper (20–25 pages) is a requirement for this course.

Population Sciences 201a. Population Growth and Fertility Control

Lectures and seminars. *Two one-hour sessions each week, first period.* Staff of the Department.

Credit 1 unit.

Recommended as part of the core curriculum for Master of Public Health candidates.

Major consideration is given to population growth and to the means of

controlling fertility in the context of public health programs. Concepts of ecology are developed to provide an understanding of the relationships between human populations and their environments. The physical, biological, and social forces which influence the demographic characteristics of a population are considered. Techniques for measuring these forces are presented, and their historical trends and future prospects are assessed.

Population Sciences 202b,c,d. Departmental Seminar

Seminars. *One two-hour session each week, second, third and fourth periods.* Staff of the Department.

Credit 3 units.

This course is oriented toward the research interests of those concentrating in the department. Each student selects a topic for special study on which he presents a critical survey of the relevant literature and later the design of a project which would provide new information. During the initial sessions, and on occasion thereafter, staff members and guests report on their own investigations.

With the permission of the Instructor, students may elect Population Sciences 202c,d without having taken 202b.

Population Sciences 203c. Demographic Methods

Lectures. *One two-hour session and one one-hour session each week, third period.*

Laboratory. *One two-hour session each week, third period.* Dr. HEER.

Credit 2.5 units.

A course on demographic methods with emphasis on the correction of vital statistics and census data, measurement of nuptiality, fertility, contraceptive effectiveness and population growth, and on the preparation of population projections.

Prerequisite: Biostatistics 101a,b.

Population Sciences 204c,d. Biological Basis for Contraception

Lectures. *One one-hour session each week, third and fourth periods.* Dr. SALHANICK, Dr. MCINTOSH and Staff of the Center for Population Studies, and Guest Lecturers.

Credit 1 unit.

This course presents the fundamental physiology and biochemistry related to known and potential methods of family planning. It will cover: the biosynthesis, secretion, effects and modes of action of the gonadal and gonadotropic hormones; the relationship of the natural steroid hormones to synthetic analogues; relationships of chemical structure to physiologic activity of the

contraceptive steroids; the human menstrual cycle and early pregnancy; biological basis for potentially new methods; and, factors related to the successful practice of contraception.

Enrollment is subject to the approval of the Instructor.

Population Sciences 205c,d. Readings in Population Studies

Seminars. *One two-hour session each week, third and fourth periods.* Dr. Heer and Staff of the Department.

Credit 2 units.

This course is an introduction to the literature pertaining to population theory, research, and fertility control programs. It is offered for students concentrating in the Department. Seminar discussions are directed toward the analysis and evaluation of the assigned selections.

Population Sciences 300. Tutorial Programs

Time and credit to be arranged.

Students at the master's level may make arrangements for tutorial work and special reading on topics related to population problems. There may be an opportunity to consider the design of studies, programs or analysis of data.

Population Sciences 330e. Field Visits

One-week period between Fall and Spring terms or one-week period between Third and Fourth quarters.

Credit 1 unit.

Students concentrating in the Department of Population Sciences may participate in visits to organizations currently active in demographic studies, community education, and programs of research and service in fertility control.

Additional Field Study

At the end of the academic year, a field visit may be arranged for students majoring in the Department of Population Sciences.

Limited to ten students.

Population Sciences 350–356. Research

Candidates for doctoral degrees may undertake research in the Department or may integrate research in population sciences with a doctoral program in another department or at the Center for Population Studies.

Members of the Department and of the Center for Population Studies are currently engaged in research in the following areas:

350 *Topics in Field Studies and Programs*, Dr. Snyder, Dr. Wyon, Dr. Plank, Dr. Guerrero, Dr. Gideon and Dr. Berggren.

351 *Topics in Biomedicine and Reproductive Physiology*, Dr. Salhanick and Dr. McIntosh.

352 *Topics in Demography*, Dr. Heer and Dr. Germani.

353 *Topics in Population Ethics*, Dr. Dyck and Dr. Potter.

354 *Topics in Population Policy*, Dr. Revelle and Dr. Snyder.

355 *Topics in Population Economics*, Dr. Leibenstein and Dr. Dorfman. (Center for Population Studies)

356 *Topics in Population and Resource Interaction*, Dr. Revelle, Dr. Thomas and Dr. Rogers. (Center for Population Studies)

Biology 150. Population Models

This course, which is presented in Harvard College, is open to properly qualified students in the School of Public Health.

Half course (*fall term*). *M., W., F., at 9.* Assistant Professor Cohen.

Mathematical models, primarily deterministic, of single populations and of populations in interaction, including discrete-time and continuous-time models with and without age structure. The uses and limitations of a few basic formal structures will be illustrated by applications in actuarial studies, anthropology, bacteriology, demography, ecology, economics, epidemiology, genetics, industrial management, water and wastewater engineering and sociology.

Within the time perspective of biological evolution, the models and examples will correspond to ecological snapshots (statics) or film clips of short duration (dynamics), and will be treated as preliminaries to evolutionary analysis.

Enrollment is subject to the approval of the Instructor.

Ethics 284. Seminar: Ethical Aspects of Population Policy

This course, which is presented in the Harvard Divinity School, is open to properly qualified students in the School of Public Health.

Half course (*spring term*). *Hours to be arranged.* Professors Dyck and Potter.

A critical examination of the religious and ethical issues associated with population trends and problems. Special attention is given to the problems associated with family planning, and with the formation, by governmental and voluntary organizations, of public policies for regulating population growth.

Natural Sciences 118. Human Populations and Natural Resources.

This course, which is presented in Harvard College, is open to properly qualified students in the School of Public Health.

Half course (*fall term*). *M. and W. at 10., and one discussion hour to be arranged.* Professor REVELLE.

Lectures, discussion, and readings on "The Population Problem," viewed in the context of balancing human populations and their resources; the primary natural resources — earth, air, fire, and water; the total environment as a resource and the ecology of cities. Malthusian and other theories of population equilibrium will be examined and also the determinants and consequences of rapid population change. Special emphasis will be laid on such questions as how the poor countries (two-thirds of mankind) can obtain enough food to feed their peoples, whether and how these countries will be able to limit the increases of their populations; and the effects on the quality of life of population and economic change in the United States and other rich countries.

Enrollment is limited and subject to the approval of the Instructor.

Department of Sanitary Engineering

Harold A. Thomas, Jr., s.b., s.m., s.d., Gordon McKay Professor of Civil and Sanitary Engineering (Absent 1971–72)

J. Carrell Morris, s.b., a.m., ph.d., a.m. (hon.), Gordon McKay Professor of Sanitary Chemistry

Joseph J. Harrington, b.c.e., a.m., ph.d., Associate Professor of Environmental Health Engineering

Steven J. Marcus, b.e., a.m., ph.d., Research Fellow in Sanitary Engineering

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The following members of the Division of Engineering and Applied Physics of the Graduate School of Arts and Sciences participate in teaching in the School of Public Health:

Myron B. Fiering, a.b., s.m., ph.d., Gordon McKay Professor of Engineering and Applied Mathematics

Ralph Mitchell, b.a., ph.d., Gordon McKay Professor of Applied Biology

Lloyd A. Spielman, b.s., m.s., ph.d., Assistant Professor of Environmental Engineering

Robert P. Burden, s.b., s.m., s.d., Co-Director of the Environmental Systems Program

The Courses in which members of this Department participate in the School of Public Health are listed under the Environmental Health courses on pages 99 and 101 (Environmental Health Interdepartmental 201a, 201b and 208a,b).

The following courses of instruction offered in the Division of Engineering and Applied Physics of the Graduate School of Arts and Sciences are open to properly qualified students:

Engineering Sciences 173 (formerly Engineering 273a). **Introduction to Environmental Microbiology**

Half course (*spring term*). M., W., F., at 11, and laboratory hours to be arranged. Professor Mitchell.

Introduction to Microbiology. Emphasis on microbial ecology. Application to problems in water pollution.

Note: This course cannot be taken for credit in addition to the former Engineering 273a.

Engineering 250a. Design of Water Resource Systems

Half course (*fall term*). *M., W., F., at 8.* Professor Thomas.

Principles of engineering and economic analysis applied to water resource systems. Functional design of comprehensive management systems for collection, storage, conveyance, treatment and distribution of water. Techniques of operations research and econometrics are used in developing methods for planning integrated systems of dams, reservoirs, canals, pipe lines and networks, pumps, and treatment plants.

Prerequisites: Engineering Sciences 105a, 121, 123 or equivalents.

Engineering 250b. Design of Water Resource Systems

Half course (*spring term*). *M., W., F., at 8.* Professor Thomas.

Continuation of Engineering 250a with emphasis on non-linear systems and systems with stochastic components. Application to problems of water pollution and design of comprehensive programs for water quality management.

Prerequisite: Engineering 250a. Statistics 190 or equivalent is desirable.

Engineering 253. Stochastic Processes

Half course (*fall term*). *Tu., Th.,* (*S.*) *at 9* Professor Fiering.

To be given in 1972–73.

Theory and applications of stochastic processes and time series for environmental and social problems, including hydrology, delivery of medical care, statistical evaluation techniques, birth-death processes, hazard perception, insurance, and queues.

Prerequisites: Engineering 250a or Engineering Sciences 119; Statistics 190.

Engineering 268. Transport Phenomena

Half course (*fall term*). *M., W., F., at 9.* Dr. ————.

Principles of mass, momentum and energy transport, emphasizing convective-diffusional mass transfer as applied to chemical process configurations: equations of forced and free convection in laminar and turbulent flows; simplified models for interphase transfer; chemically reacting systems; estimation of transport properties; electrolyte transport; coupled processes.

Enrollment is subject to the approval of the Instructor.

Engineering 270a. Engineering Systems for Environmental Control

Half course (*spring term*). *M., W., F., at 10.* Associate Professor Harrington.

Provision of urban water; engineering aspects of the collection and disposal of spent water and solid wastes; significant interchanges between the gaseous, liquid and solid phases of the environment; geographic interchanges; time-

dependent developments. Data collection and processing for monitoring and control; maintenance and operation of pollution control systems.

Prerequisite: Engineering Sciences 123.

Engineering 270b. Water Process Technology

Half course (*spring term*). *M., W., F., at 12, and laboratory hours to be arranged.* Assistant Professor SPIELMAN.

Principles of design and scale-up of chemical and mass transfer operations applied to water treatment and pollution control: dimensional methods; use of bench- and pilot-scale rate and equilibrium data in the engineering of full scale reactors and selective transfer operations such as adsorption, ion exchange, gas absorption, liquid extraction, leaching and drying.

Prerequisite: Engineering 268 or Engineering 228 which may be taken concurrently.

Engineering 271a. Chemistry of the Aqueous Environment

Half course (*fall term*). *M., W., F., at 11, and laboratory, F., 2–5.* Dr. BUTLER.

To be given in 1971–72.

Chemical principles applicable to environmental science and engineering. Physical chemistry of acqueous media with emphasis on solution and heterogeneous equilibria. Principles of analytical chemistry and their application to analysis of water. Sources occurrence, and chemical reactions of important constituents in natural waters.

Prerequisite: Chemistry 40a or 60 or equivalent chemical background.

Engineering 272a. Water Quality and Its Management

Half course (*spring term*). *Tu., Th. 11–12:30.* Dr. BUTLER.

Nature, sources and effects of inorganic and organic impurities in natural waters. Water quality standards. Effects of water use on quality. Natural purification of surface waters. Chemistry of water and waste-water treatment. Water renovation and reuse.

Note: This course cannot be taken for credit in addition to the former Engineering 271b.

Prerequisites: Engineering Sciences 173 and Engineering 271a; Engineering 270b should be taken concurrently.

Engineering 273. Water Pollution Microbiology

Half course (*fall term*). *Hours to be arranged.* Professor MITCHELL.

An advanced course in which the role of microorganisms both as pollutants and as purifying agents will be discussed. Particular attention will be

given to ecological approaches to pollution control. Topics will include eutrophication, microbial imbalances, pesticides, stream purification, and a critical discussion of current waste treatment methods.

Prerequisite: Engineering Sciences 173 or equivalent.

Engineering 275. Mechanics and Separation of Particulates

Half course (*fall term*). *M., W., F., at 11.* Assistant Professor SPIELMAN.

To be given in 1972–73.

Low Reynolds number approach to suspended particulates in water and air; mechanics of bubbles and drops; precipitation and dissolution; mechanism of electrokinetic phenomena; mechanisms of particle capture in porous solids; nonideal settling; kinetics of coagulation and the theory of self-preserving particle size spectra; coalescence of oil-in-water dispersions induced by flow through porous solids.

Prerequisite: Engineering 268, Engineering 228, or equivalent.

Engineering 277. Surface Chemistry

Half course (*fall term*). *M., W., F. at 9.* Professor MORRIS.

To be given in 1972–73.

Liquid surfaces and surface-active materials. The Gibbs equation. Two-dimensional equations of state. Adsorption at solid surfaces. The colloidal state. Electrokinetic phenomena. Structure, surface properties, and colloidal behavior of hydrous oxides and silicate minerals.

Prerequisite: Engineering 271a.

Engineering 278. Reaction Rates and Mechanisms

Half course (*fall term*). *M., W., F., at 10.* Dr. ———.

Chemical kinetics, with emphasis on reactions in aqueous systems, diffusion and enzyme-mediated processes. Interpretation of kinetic data. Inorganic reaction mechanisms.

Prerequisite: Engineering 271a, or equivalent.

Engineering 279. Applied Electrochemistry

Half course (*fall term*). *Hours to be arranged.* Dr. MCKINNEY.

To be given in 1972–73.

Dynamic interpretation of electrochemical processes. Electrode kinetics, the electric double layer, and electrokinetic phenomena. Applications to chemical processes, metallic corrosion, passivity, cathodic protection, batteries, fuel cells, and environmental science.

Prerequisite: Chemistry 60 or similar background.

Department of Tropical Public Health

Thomas H. Weller, A.B., S.M., M.D., LL.D., Richard Pearson Strong Professor of Tropical Public Health, Director of the Center for the Prevention of Infectious Diseases, *and* Head of the Department

Eli Chernin, S.B., A.M., S.D., A.M. (hon.), Professor of Tropical Public Health.

Edward H. Michelson, S.B., S.M., PH.D., Associate Professor of Tropical Public Health

Richard H. Morrow, Jr., A.B., M.D., M.P.H., Associate Professor of Tropical Public Health

Steve C. Pan, B.SC., M.D., M.P.H., Associate Professor of Tropical Public Health

Andrew Spielman, S.B., S.D., Associate Professor of Tropical Public Health.

Richard H. Daggy, S.B., S.M., PH.D., M.P.H., DR.P.H., Lecturer on Tropical Public Health *and* Associate Dean for International Programs

*Warren L. Berggren, S.B., M.D., M.P.H., DR.P.H., Assistant Professor of Applied Tropical Public Health; *Director of Community Health, Hôpital Albert Schweitzer, Haiti*

Peter Braun, S.B., M.D., Assistant Professor of Tropical Public Health

*Catherine Coolidge, A.B., M.D., M.P.H., Assistant Professor of Tropical Public Health.

*Robert L. Kaiser, A.B., M.D., D.T.M. & H., Visiting Lecturer on Tropical Public Health; *Director, Malaria Program, National Center for Disease Control*

*Harry Most, S.B., M.D., D.T.M. & H., D.M.S., Visiting Lecturer on Tropical Public Health; *Herman N. Biggs Professor and Chairman, Department of Preventive Medicine, New York University School of Medicine*

*Franklin A. Neva, S.B., M.D., A.M. (hon.), Visiting Lecturer on Tropical Public Health; *Chief, Laboratory of Parasitic Disease, National Institute of Allergy and Infectious Diseases, National Institutes of Health*

*Elvio H. Sadun, B.S., S.M., SC.D., Visiting Lecturer on Public Health; *Chief, Department of Medical Zoology, Walter Reed Army Institute of Research*

*Nevin S. Scrimshaw, A.B., A.M., PH.D., M.D., M.P.H., Visiting Lecturer on Tropical Public Health; *Professor of Nutrition and Head, Department of Nutrition and Food Science, Massachusetts Institute of Technology*

*David J. Sencer, M.D., M.P.H., Visiting Lecturer on Tropical Public Health; *Chief, National Center for Disease Control*

* Part-time in the School of Public Health.

*John M. Weir, s.b., m.d., ph.d., m.p.h., Visiting Lecturer on Tropical Public Health; *Consultant, The Rockefeller Foundation*

Monte P. Bawden, a.b., ph.d., Research Associate in Tropical Public Health

*Charlotte F. Litt, a.b., s.m., ph.d., Research Associate in Tropical Public Health

Joseph L. Waner, s.b., s.m., ph.d., Research Associate in Tropical Public Health

Robert W. Gwadz, s.b., ph.d., Research Fellow in Tropical Public Health

Leonard C. Marcus, b.s., d.v.m., m.d., Research Fellow in Tropical Public Health

Susan K. Wheeldon, b.sc., a.m., Assistant in Tropical Public Health

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Gustave J. Dammin, a.b., m.d., a.m. (hon.), *Elsie T. Friedman Professor of Pathology, Harvard Medical School*

Franz C. von Lichtenberg, m.d., dr. (hon.), *Associate Professor of Pathology at the Peter Bent Brigham Hospital*

The health problems of the tropical regions, as in poorly sanitated areas of the world elsewhere, are predominantly of an infectious and nutritional nature. The infectious diseases are the primary concern of the Department of Tropical Public Health, with particular emphasis given to protozoal, helminthic, and viral entities and to relevant arthropod and molluscan intermediate hosts. Within the framework of the Center for Prevention of Infectious Diseases, the Department of Tropical Public Health shares with the Department of Microbiology the responsibility for an integrated presentation of information on important infectious agents that produce disease in man. Emphasis is given to the ecology and epidemiology of the major infectious diseases and to their prevention and control.

The resolution of the health problems of tropical areas, as elsewhere, requires not only a specific knowledge of diseases but a multidisciplinary approach involving a considered appraisal of human resources as well as of relevant social, economic, and political factors. This elemental concept underlies the teaching program of the Department of Tropical Public Health, and is exemplified in the course Tropical Public Health 203d, Problems in Tropical Health, open to all students. However, the student concentrating in the Department in preparation for a career in the field of international health should, in addition to Departmental courses, acquire a broadened experience by elective work in other areas under the aegis of the Division of International Health.

The basic course, Microbiology and Tropical Public Health 201a,b is designed to provide students in the Master of Public Health program with newly-elaborated knowledge regarding major infectious diseases, and with the factual information concerning the epidemiology and control of selected entities of public health importance. Students concentrating in the Department will normally be expected to elect Microbiology and Tropical Public Health 202b, Tropical Public Health 203d, and Tropical Public Health 204c. Other advanced courses in Tropical Public Health are considered electives, to be selected on the basis of individual student interest and need.

The investigative program in the Department is broad and currently deals with pathogens ranging from viruses to helminths. Thus, studies on the *in vitro* cultivation and the physiology and immunology of a wide variety of agents are in progress. Biological investigations on the molluscan vectors of the schistosomes comprise another area of major interest. Facilities are available for the training of a limited number of students at the Doctor of Public Health or Doctor of Science level, who may wish to spend a minimum of two years with emphasis on a program of original research. Due to time limitations, the Doctor of Science applicant should, in so far as possible, obtain the necessary medical science background prior to enrollment.

A program supported by the National Institutes of Health is available to assist qualified applicants who desire training in medical parasitology and a similar program is available to provide training in tropical medicine. Collaborative arrangements established with institutions in the tropics provide diversified opportunities for study and research overseas.

Microbiology and Tropical Public Health 201a,b. Ecology and Epidemiology of Infectious Diseases

Lectures, seminars, and laboratory exercises. *Three one-hour sessions and one three-hour session each week, first period; one one-hour session and two two-hour sessions each week, second period.* Dr. Weller, Dr. Nichols and Staffs of the two Departments.

Credit 4 units.

Recommended as part of basic core curriculum for Master of Public Health candidates.

This course is designed to provide an integrated presentation of information on communicable diseases of major public health importance. The exercises include discussions of the present status of infectious diseases in temperate and tropical climates, of procedures for their control at the community level, and of techniques available for study of microorganisms and parasites with special reference to recently developed methods which have opened a new era in microbiology. Coverage of etiologic agents includes the protozoa, helminths, viruses, rickettsiae, spirochetes, fungi, and bacteria. To achieve a comprehensive approach, subjects of public health importance and

of diverse etiologies, such as the acute respiratory diseases, are considered in an integrated manner. Other important entities, such as malaria and schistosomiasis, are selected for emphasis as case examples to illustrate epidemiological concepts and the elements of control.

The course assumes a medical school background and an understanding of the pathogenesis of disease produced by infectious agents in the affected individual. It is concerned primarily with the ecologic factors affecting transmission of infectious agents in the human community, with assessment of public health significance of representative infectious diseases, and with approaches to their prevention and control. In the laboratory, the student is not expected to acquire technological skills, but rather an understanding of the potentialities as well as of the limitations of pertinent public health laboratory procedures.

Microbiology and Tropical Public Health 202b. Current Research in Infectious Diseases

Seminars. *One two-hour session each week, second period.* Dr. CHERNIN, Dr. VINSON and Staffs of the Departments of Microbiology and Tropical Public Health.

Credit 1 unit.

This course is required of all students concentrating in Microbiology or Tropical Public Health. Papers on topics of general interest are selected from current periodicals and critically reviewed as to soundness of experimental design, validity and significance of results and conclusions, organization of manuscripts and clarity of presentation.

Enrollment of nondepartmental students subject to approval of Instructor.

Tropical Public Health 203d. Problems in Tropical Health

Lectures and conferences. *One two-hour session each week, fourth period.* Dr. WELLER and Guest Lecturers.

Credit 1 unit.

This course is designed to provide general background information on environmental, social, economic, and political factors influencing the development of health programs in the tropics. At each session a distinguished guest lecturer covers an assigned topic; the subject material includes such diversified topics as the development of professional education in tropical areas, the important problems of agriculture, nutrition, and water supply, and the administrative and political backgrounds in the field of international technical cooperation. Each formal presentation is followed by a period devoted to informal student discussion. Enrollment is open to all students.

Tropical Public Health 204c. Public Health Aspects of Parasitic Diseases

Lectures, seminars, and laboratory exercises. *Two three-hour sessions each week, third period.* Dr. PAN, Dr. BRAUN, Dr. COOLIDGE and Staff of the Department.

Credit 2.5 units.

This course amplifies material presented in the basic course, and additionally provides coverage of significant parasitic entities not dealt with in Microbiology-Tropical Public Health 201a,b. Concepts relevant to the investigation and control of parasitic diseases, such as quantitation of infection, are stressed. Selected examples of control programs will be examined. In the laboratory, the student will become familiar with techniques essential for the epidemiologic investigation of the important parasitic diseases of man.

Enrollment is limited and is subject to the approval of the Instructor.

Tropical Public Health 205c. Clinical and Pathologic Features of Tropical Diseases

Case presentations, clinico-pathologic conferences, and demonstrations. *One two-hour session each week, third period.* Dr. WELLER, Dr. MORROW, Dr. BRAUN, Dr. LICHTENBERG and Staff of the Department.

Credit 1 unit.

This course, designed for students particularly interested in tropical medicine, supplements material presented in Microbiology-Tropical Public Health 201a,b. The emphasis is on the clinico-pathologic aspects of tropical diseases. At each session one or more disease entities are introduced by presentation of a clinical case and pertinent clinical and pathologic features of the disease are then reviewed.

Enrollment is subject to the approval of the Instructor.

Microbiology and Tropical Public Health 206d. Tuberculosis

Seminars. *One two-hour session each week, fourth period.* Professor CAMPBELL, Dr. MORROW and Dr. MACK.

Credit 1 unit.

The purpose of this course is to provide an understanding of the ecology and the public health significance of tuberculosis which continues to be a worldwide problem of major importance. Various features of tuberculosis are discussed; particularly the microbiologic, medical, social, and economic aspects.

The significance of differentiating diseases often confused with tuberculosis, especially the respiratory mycoses and "atypical" mycobacterioses, is also considered. These discussions are based on selected reports in the literature and experiences of students and Faculty members in developed and developing nations with tuberculosis programs and control.

Visits to local tuberculosis hospital laboratories are arranged upon request.

Tropical Public Health 207d. Introduction to Molluscs of Public Health Importance

Conferences, laboratory and field exercises. *One three-hour session each week, fourth period.* Dr. MICHELSON.

Credit 1 unit.

To be given in 1972–73, alternates yearly with Tropical Public Health 208d.

This is an introductory course designed to acquaint the student with the molluscs which may act either as active or passive agents for the dispersal of pathogens, toxins, or parasites which cause disease in man. Special emphasis is given to snails which serve as intermediate hosts of mammalian schistosomes. Students are offered the opportunity to study field and laboratory techniques necessary for an understanding of the taxonomy, morphology, cultivation, ecology and control of these medically important molluscs.

Enrollment is subject to the approval of the Instructor.

Tropical Public Health 208d. Epidemiology and Control of Schistosomiasis

Seminars and laboratory exercises. *One three-hour session each week, fourth period.* Dr. MICHELSON, Dr. CHERNIN, Dr. PAN and Dr. WELLER.

Credit 1 unit.

To be given in 1971–72, alternates yearly with Tropical Public Health 207d.

The problems posed by schistosomiasis as an expanding health hazard are presented in a series of seminars and laboratory exercises. Emphasis is given to the biology of snail vectors, to problems of assessment of significance of the disease, and to the potentials of various approaches to control. Opportunity to become familiar with appropriate techniques is afforded in the laboratory.

Enrollment is subject to the approval of the Instructor.

Tropical Public Health 209d. Introduction to Medical Entomology

Conferences, laboratory, and field exercises. *One three-hour session each week, fourth period.* Dr. SPIELMAN.

Credit 1 unit.

To be given in 1971–72; alternates yearly with Tropical Public Health 210d.

This course deals with the insects, ticks, and mites of public health importance. The manner in which arthropods transmit disease and the principles of vector control are discussed from ecological, physiological and genetic points of view. Each conference presents an aspect of arthropod biology as it pertains to public health. Laboratory colonies of various vector species are maintained by the students to provide the basic material for study of life cycles and for arthropod identification. Laboratory and field exercises demonstrate entomological techniques currently employed by epidemiologists.

Enrollment is subject to the approval of the Instructor.

Tropical Public Health 210d. Current Problems in Malariology

Seminars and laboratory exercises. *One three-hour session each week, fourth period.* Dr. CHERNIN, Dr. SPIELMAN, Dr. WELLER and Staff of the Department.

Credit 1 unit.

To be given in 1972–73; alternates yearly with Tropical Public Health 209d.

This course supplements the subject material on malaria offered in Microbiology-Tropical Public Health 201a,b and Tropical Public Health 204c. Particular attention is given to problems now encountered in eradication and control programs. In the laboratory, experience is provided with procedures essential to the epidemiologic investigation of malaria.

Enrollment is subject to the approval of the Instructor.

Tropical Public Health 212c. Biomedical Writing

Seminars. *One two-hour session each week, third period.* Dr. CHERNIN.

Credit 1 unit.

Writing scientific papers is an integral part of the research process. This course is intended to develop practical skills and provide experience in planning and writing articles that meet the editorial demands of biomedical journals. The salient elements of a well-prepared article — logical organization, good scientific prose, and understandable tables and figures — will be emphasized by criticizing short papers written by the participants on biomedical subjects of their own choice.

Enrollment limited to ten students with advance approval of the Instructor.

Microbiology and Tropical Public Health 214c,d. Case Studies in Epidemiology of Infectious Disease

Conferences, seminars, laboratory exercises. *One two-hour session each week, third and fourth periods.* Dr. NICHOLS, Dr. MACK and Dr. MORROW.

Credit 2 units.

This course is constructed to provide experience in solving epidemiologic problems in communicable disease. Actual epidemics of such disease as tuberculosis, hepatitis, arbovirus, and smallpox are solved on paper in classroom laboratory-type sessions with emphasis on a commitment by the participants at each stage of the solution.

Tropical Public Health 300a,b,c,d,e. Tutorial Programs

Laboratory exercises. *Time and credit to be arranged.*

Individual work for candidates at the Master's degree level may be carried out under supervision of a member of the Department. A variety of parasites of medical importance are maintained and are available for studies on metab-

olism, host-parasite relationships, and chemotherapy. Arrangements are subject to the approval of the Instructor.

Tropical Public Health 350. Research

Doctoral candidates or qualified full-time special students may undertake original investigations in the laboratory or in the field by arrangement with the Head of the Department.

Members of the Department are currently engaged in the following areas of research:

351 Tissue culture, organ culture, and immunological techniques as applied to problems in medical virology (Dr. Weller and Dr. Braun).

352 Cultivation *in vitro* of parasitic helminths, protozoa, and other invertebrates of medical importance (Dr. Weller, Dr. Chernin and Dr. Pan).

353 Biology, host-parasite relationships, and control of molluscan vectors of schistosomiasis and of other parasitic infections (Dr. Chernin, Dr. Michelson and Dr. Pan).

354 Population genetics, nutrition, and reproduction of medically important arthropods (Dr. Spielman).

355 Arthropod transmission of viral, protozoan, and helminthic agents (Dr. Spielman).

356 Etiology and epidemiology of mycobacterial diseases (Dr. Morrow).

FIVE

SPECIAL PROGRAMS

Programs in International Health

The School of Public Health has developed a Division of International Health. The primary objective of this Division is to utilize all departments and facilities of the School, as well as other related divisions of the University, to provide a comprehensive, effective, and efficient program of teaching, research, and service in all fields of international health.

The programs centered in the School, together with related course offerings in other divisions of Harvard University and the Massachusetts Institute of Technology, offer the student a broad background in preparation for future careers in the World Health Organization, the Agency for International Development of the U.S. State Department, the U.S. Public Health Service, the Peace Corps, the Armed Forces, industrial organizations, mission groups, philanthropic foundations, or with other governments and agencies providing varied careers in international health and in planning health services for developing countries.

The relevant course offerings are not concentrated in any one department of the School, since all departments have broad international interests in their respective fields. In addition to the requirements for the Master of Public Health degree, a varied selection of elective courses is available in the various Departments of the School in preparation for careers in international health.

Other divisions of Harvard University, namely the:

Medical School
Faculty of Arts and Sciences
Graduate School of Government
Center for Middle Eastern Studies
East Asian Research Center and
Development Advisory Service of the
Center for International Affairs

provide additional opportunities for study in medicine, economics, public administration, anthropology, government, social relations, language, and related subjects for students with special interests in particular regions of the world. Cross-registration opportunities for students interested in similar course offerings given by the Massachusetts Institute of Technology are also available. The various catalogues of these Faculties may be consulted for further details.

Programs of study may be selected leading to the Master of Public Health or Master of Science degree. Advanced students may be accepted as candidates for the Doctor of Public Health or Doctor of Science degree. A three-year residency program for physicians preparing for certification by the American Board of Preventive Medicine in the area of General Preventive Medicine (International Health) is also available to selected students.

Areas in which supervised field work or research may be undertaken will vary, depending on current opportunities afforded and the availability of qualified supervision. For example, under the sponsorship of the Department of Tropical Public Health, trainees have been engaged in studies on schistosomiasis in Nigeria and Brazil, on malaria in Gambia, and on nutritional anemias in Uganda. The Department of Nutrition has sponsored trainees in nutritional studies in Colombia. Other relationships have been or are in the process of being established with the Hôpital Albert Schweitzer in Haiti, Ministry of Health in the Bahamas, Puerto Rico, Jamaica, Brazil, Tunisia, Italy, Israel, Lebanon, Saudi Arabia, Nigeria, and in other developing areas of the world. Assignments to international agencies for work experience or research activities abroad are made only when the School is assured that competent local supervision and guidance are available.

Examples of current international research being conducted by the School include trachoma research in Saudi Arabia; effects of lysine enrichment of wheat and rice in Tunisia and Thailand; comparative heart disease studies in Ireland and U.S.; nutrition research in Colombia and Israel; population studies in Greece, United Arab Republic and India; typhus in Yugoslavia; research on urinary calculi in Thailand; cooperative cardiovascular disease investigation

in Japan; relative importance of hereditary environmental factors in cardiovascular disease in Israel; collaborative studies on cervical cancer, breast cancer and leukemia involving numerous countries; and comparisons of prevalence of chronic respiratory disease between the United States and the United Kingdom, and the United States and Japan.

The School has sponsored triennial meetings of the *Industrial Council for Tropical Health* since 1950. These conferences bring together guest experts, members of the Faculty, and medical and managerial personnel of corporations having interests in tropical regions for scientific and practical discussions of health problems. Through these conferences the School has established a wealth of international contacts which are of mutual benefit to industry, the School, its students, and alumni throughout the world.

International House, the School's residence for its graduate students and their families, both from the United States and abroad, provides an unusual opportunity for international contacts and extracurricular activities with professional health workers from a variety of countries. Some twenty-two to twenty-eight nations

An International House tea

are represented in this group each year. Throughout the year there are opportunities for informal interchanges of ideas between students and their families. In addition, there are frequent discussions on topics of international interest, including presentations by international students on the culture, geography, social structure, and health problems of their home countries.

Finally, the Boston area as a whole provides a stimulating atmosphere for students interested in international affairs through such agencies as the local chapter of the Society for International Development, World Affairs Council, Pan American Society of New England, and many other agencies, programs and activities.

More current details on residency opportunities or other aspects of these programs may be obtained by addressing inquiries to Dr. Richard H. Daggy, Associate Dean for International Programs at the School.

Program in Occupational Medicine

The School offers to qualified applicants the two years of academic training requisite to certification in Occupational Medicine. Physicians may enroll in this program through any of the master's degree programs offered by the School. Physicians planning an academic or research career may be accepted for work toward a doctoral degree in occupational medicine or environmental health. Other students may elect a second year of formal courses and tutorial study in occupational medicine and public health. The usual course content of the first-year program is listed under the Master of Industrial Health degree. Additional courses and course content may be found under the departmental listings. In addition, as in other programs of the School, it is possible to cross-register with other Harvard faculties and with Massachusetts Institute of Technology to pursue special interests.

Clinical experience is offered in certain of the Harvard-affiliated hospitals where both occupational and non-occupational disease can be seen. Further experience is obtained through the University Health Services at Harvard (approved for third year, in-plant residency) and the Occupational Medical Services at Massachusetts Institute of Technology. Experience in an industrial medical department can be arranged during the summer months in selected local industries to supplement the academic training.

Financial support is available from Federal grants to the School. United States citizenship or permanent residency status is required for these fellowships. For more detailed information on various aspects of the Program address inquiries to Dr. James L. Whittenberger, Professor and Head, Department of Physiology, Harvard School of Public Health.

Interfaculty Program on Health and Medical Care

The Interfaculty Program on Health and Medical Care is a cooperative undertaking of the Schools of Public Health, Medicine, Government, Business Administration, and the Department of Economics in the Faculty of Arts and Sciences. Its major purpose is to provide advanced programs in the economics and administration of medical care at both the master's degree and doctoral levels for personnel in the various relevant disciplines.

The Program is intended to equip the student for administrative and policy-making posts in medical care programs or for related teaching and research positions. The Program is planned for several types of students: (1) for those whose needs are met by a a master's degree program at the School of Public Health or School of Government, (2) for students who wish to specialize more intensively in medical care during a two year-period, (3) for doctoral candidates under the guidance of any of the participating faculties, and (4) for physicians participating in the residency program in General Preventive Medicine (Health Services Administration) in the School of Public Health.

The Program offers training and research experience in the provision of medical care services and stresses the study and analysis of varying patterns of organization, delivery, and financing of personal health services in the United States and other countries. Students include physicians and other health professionals, economists, social scientists, and management analysts. They are from the various participating schools and departments within Harvard University, and are enrolled as master or doctoral degree candidates in their own schools and departments while taking the Program's basic courses.

A wide range of elective courses is available, in addition to those offered by the School of Public Health, through the various faculties concerned and from the Massachusetts Institute of Technology.

The objective with students enrolled in the School of Public Health is to instruct them in analysis and decision-making and to give them an appreciation of the application of the administrative and social sciences in the operation of medical care programs. For students from other than the School of Public Health, the Program's objective is to provide an adequate understanding of medical care and the special attributes of organized forms of medical care services and to encourage the intelligent application of their own specialties to analysis, planning, evaluation, and research in the field of personal health services.

The Program's research studies provide opportunities for exceptional students to undertake doctoral work and to gain substantial research experience.

For more detailed information on various aspects of the Program, including support for physician residency training, address inquiries to Dr. Alonzo S. Yerby, Professor of Health Services Administration and Director of the Interfaculty Program on Health and Medical Care.

Postdoctoral Fellowship Program in Dental Public Health

The School of Dental Medicine in cooperation with the School of Public Health and the Massachusetts Department of Public Health offers a three-year program of postdoctoral study intended to prepare a limited number of individuals for creative full-time careers in dental public health and ecological dentistry. Each person accepted into the program will be appointed as a Research Fellow in Ecological Dentistry at the School of Dental Medicine.

The first year of the program is spent at the School of Public Health as a candidate for the degree of Master of Public Health. Graduates of other such schools, however, may be accepted into the program with one year advanced standing. The second year involves residency training in cooperation with the Massachusetts Department of Public Health to meet the requirements of the American Board of Dental Public Health. The third year affords opportunity for advanced didactic work and research at the School of Dental Medicine, the School of Public Health and/or other institutions. A research thesis is prepared in this year. A three-year postdoctoral fellowship certificate is awarded upon completion.

The program is designed to meet the needs of the particular student. Academic study beyond the master's level may be arranged in other departments of the University. Residency training involves responsible work with the Massachusetts Department of Public Health at the state or community level. Epidemiological or other research work can be carried on over the entire three-year period in a variety of situations involving either new or continuing studies.

For further information and application forms, write to James M. Dunning, D.D.S., M.P.H., Professor of Ecological Dentistry, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, Massachusetts, 02115.

Special Courses in Preparation for Careers in Teaching

The role of community-oriented instruction in medical education has, in recent years, been receiving increasing recognition. Major changes are taking place in the teaching of public health and preventive medicine, both in the United States and abroad. The challenge of expanding teaching responsibilities has led to a growing need for qualified teachers of public health, preventive medicine, and preventive dentistry in schools of public health, medicine and dentistry as well as in community-based health programs.

The interest of the Harvard School of Public Health in preparing students for teaching posts both within the United States and abroad is underscored by the fact that approximately 60% of our students plan to teach on a full-time basis following graduation from the School. In many instances such alumni prepared for their teaching and research careers by completing the program for the degree of Doctor of Public Health or Doctor of Science in their chosen academic specialties. Although the curriculum has emphasized didactic instruction in a particular academic discipline as well as training in research methodology, there has, however, been a need for special courses in teaching methods to supplement the various programs of the twelve departments of the School.

The special courses in teaching methods which were developed during 1961–1965 have been continued and further modified. Their major goals are:

1. To develop competence in the formulation of education policy in the field of community medicine and public health.
2. To introduce students to modern educational methods and media and enable them to utilize specific methods to implement their own instructional objectives.
3. To help students to develop patterns of self-education through

which they may continue to increase their competence in teaching after completion of the program.

These courses may be taken as part of a program leading to either a Master of Public Health or Master of Science degree.

The objectives of the special courses are carried out by supplementing the existing departmental course structure by means of special seminars, workshops, and tutorial instruction offered by senior members of the Faculty. Participants include Faculty from Harvard Graduate School of Education and from other Harvard Schools as well as specialists in medical education from departments of community medical education from this country and abroad. The basic course on Educational Methods provides an overview of current educational theory and methodology in terms of the relevance to public health teaching. This includes principles of curriculum development, formulation of educational objectives, selection of teaching methods, and forms of evaluation. A final section of the course gives students an opportunity to study educational methods in depth.

Five seminars on educational policy are offered which orient students to special problems and issues associated with teaching community medicine and public health. The various approaches to teaching are considered in historical and geographical perspective and in relation to the changing goals of education in the health sciences.

Further information on the special courses may be obtained by addressing inquiries to Dr. Ascher J. Segall, Associate Professor of Epidemiology.

SIX

GENERAL INFORMATION

Registration

Registration in the School of Public Health for the academic year 1971–72 will be held on the following dates:

September 13, Monday, 10 A.M.	Opening session and registration for new International Students
September 15, Wednesday, 2 P.M.	Opening session and registration for new U.S. Students
September 20, Monday, 10 A.M.	Opening session and registration for students enrolled in 1970–71

The period between the opening sessions and September 22 will be devoted to orientation lectures, individual conferences with Faculty members, and selection of courses of study. All students are required to attend the opening session and to be present for the registration period.

International Students

A program of lectures and discussions during the period from Monday, September 13 through Tuesday, September 21, 1971, is planned to acquaint the students with our customs and teaching methods, with library and other facilities available. It includes visits to various University departments and to hospitals or public health activities in Boston.

During this period each student who comes from outside the United States will have a conference with the Associate Dean for International Programs to discuss his particular needs and interests. The Associate Dean, as well as the staff of the Dean's Office, is available for consultation with students throughout the year.

All students who are not citizens of the United States are re-

ferred during the orientation period to the Harvard International Office, Holyoke Center, 75 Mt. Auburn Street, Cambridge, where they show their passports and fill out a Student Registration form.

Fees and Expenses

The tuition fees for the academic year 1971–72 are listed below. The fee includes the Health Service Fee for medical care and hospital insurance for all resident students. Each candidate for a degree must have a minimum of one year of residence at the School at full tuition.

	1971–72
Full-time resident students	$2,800
Half-time resident students	1,600
All students will pay tuition at the above rates with the following exceptions:	
Doctoral candidates or Special Students in the second or later years of a doctoral or special program:	
Full-time resident students	1,600
Half-time resident students	850
Non-resident doctoral candidates, registered in absentia	200
Part-time Special Students, enrolled for less than half-time:	
First credit unit of work	120
Each additional unit per term up to 10 units	57.50

Summer Session — Effective July 1, 1972

Students who register and receive credit for research or supervised study during the 12-week summer period	$425
Students registered for less than 12 weeks will pay at a proportionate rate.	

Payment of Fees

Bills for tuition and fees will be issued and payable as follows:

Issued	*Payable*	
At registration	Within 10 days	¼ Tuition
Nov. 30	Dec. 15	¼ Tuition Miscellaneous Charges
Jan. 30	Feb. 15	¼ Tuition Miscellaneous Charges
April 30	May 15	¼ Tuition Miscellaneous Charges
June 3*	June 10	Miscellaneous Charges
June 30	July 15	Miscellaneous Charges

Students who are candidates for degrees must have paid all dues to the University at least one day before the day upon which the degrees are to be voted. A student who leaves during the year is charged to the end of the tuition period in which he leaves, provided before that time he gives the Dean notice in writing of his withdrawal; otherwise he is charged to the end of the tuition period in which such notice is given.

A student who leaves the University for any reason whatever must pay all charges against him immediately upon receipt of a bill from the Comptroller's Office. Every student is held responsible for the payment of fees until he has notified the Dean of his intention to withdraw from the School.

All term bills are sent to the student at his local address unless the Comptroller's Office is requested in writing to send them elsewhere.

Any student whose indebtedness to the University remains unpaid on the date fixed for payment is deprived of the privileges of the University. Reinstatement is obtained only by consent of the Dean of the School in which the student is enrolled after payment of all

* Applies only to candidates for degrees.

indebtedness and a reinstatement fee of $10. In addition as a condition of reinstatement such student is required to file with the Comptroller a bond in the amount of $1000 as security for the payment of future term bills.

Field Observation Study Visit

The estimated cost of travel, hotel accommodations, and food for the one-week study period in Puerto Rico (Maternal and Child Health 330e) is $300. Each student wishing to enroll in either course should assure himself that the necessary funds to cover this expense are available from his fellowship or other sources.

Student Health Service

Under the University Health and Insurance Plan, students at the School of Public Health receive medical care and insurance toward hospital expenses. Medical care is provided through the facilities of the Medical Area Health Service, located in Vanderbilt Hall. The hospitalization insurance extends for a period of twelve months from September 1, and covers hospitalization in Boston and elsewhere. Research and Teaching Fellows who are in a training status are required to enroll in the Student Health Plan unless they can show that they have comparable coverage.

A prepaid program for the care of wives (including Maternity Benefits) and children of full-time students is available. As the plan provides extensive benefits for ambulatory and inpatient care, all who are eligible are strongly advised to enroll. Its coverage, like that of the Student Plan, extends for a period of twelve months from September 1, and provides full semi-private hospitalization benefits. Information about the plan for dependents is sent to students in advance of registration or may be obtained from the Registrar.

Evidence of successful vaccination against smallpox within three year is required for entrance to Harvard University, and a certification form for this purpose is sent to each student who is accepted for admission.

Any illness necessitating absence from classes should be reported to the Medical Area Health Service Office by the student or an attending physician, and to the Registrar's Office at the School. A physician from the Medical Area Health Service is on call twenty-four hours a day and can be reached through the switchboard of Harvard University.

Housing

The Henry Lee Shattuck International House is an apartment residence operated on a nonprofit basis by the Harvard School of Public Health for its full-time students and their families. The sixty-one furnished apartments are leased on a ten-month basis for the period September 1 through June 30 rather than the customary twelve months. Special arrangements can be made for summer rentals in July and August.

Henry Lee Shattuck International House

Residents enjoy a wide selection for browsing, reading and borrowing in the International House library.

The children have their own playroom indoors and a playground outside.

The necessary application forms and additional information regarding the House may be obtained by writing to:

Mrs. Margaret D. Penrose
Director, Shattuck International House
Harvard School of Public Health
55 Shattuck Street
Boston, Massachusetts 02115

The deadline for submitting applications is May 1. However, late applications will be accepted as long as space is available.

In general, housing in Boston is expensive and adequately furnished apartments are limited. Additional information on housing may be obtained from the Harvard University Housing Office, 1737 Cambridge Street, Cambridge, Mass. 02138.

Fellowships, Traineeships and Scholarships

Most students in training for a career in public health are able to obtain financial assistance, in some cases adequate to meet the costs of living in Boston. The applicant should be aware, however, of the many restrictions on the availability of such funds. Most of the funds for financial aid are available through grants from the federal government, and eligibility for these requires U.S. citizenship or equivalent status. Almost without exception, students must be enrolled on a full-time basis and be candidates for degrees. A very small amount of money is available on a scholarship basis from University funds; *this is sufficient for only one or two awards per year.*

Detailed information can be obtained by writing to the Director of Admissions, Harvard School of Public Health, 55 Shattuck Street, Boston, Massachusetts 02115.

Students 1970-71

Degree Candidates and Full-time Students

Mirna Aeschlimann-Herrera, M.D.	Santiago, Chile
Ezzat K. Amine, B.SC., S.M. IN HYG.	Alexandria, Egypt
Ralph D. Aserkoff, A.B., M.D.	Chestnut Hill, Mass.
Lynne M. Ausman, S.B., S.M. IN HYG.	Monterey, California
Marilyn L. Baird, A.B.	Barrington, Rhode Island
Dileep G. Bal, M.B.,B.S., S.M.	New Delhi, India
Joan Barenfanger, S.B.	Boston, Mass.
Louise N. Bell, A.B., M.P.A., S.M. IN HYG.	Pittsburgh, Pennsylvania
Jonathan Berall, A.B., M.D.	New York, New York
Elaine C. Berlinsky, A.B.	Providence, Rhode Island
Jay C. Bisgard, A.B., M.D.	Des Plaines, Illinois
Michael A. Blau, B.SC., D.D.S.	Montreal, Canada
Caroline V. Blonde, A.B., M.D.	Albany, New York
*Vicente R. Borrero, M.D., M.P.H., S.M. IN HYG.	Cali, Colombia
Mark E. Bradley, S.B., M.D., S.M.	Wellesley, Mass.
Kenneth Bridbord, B.CH.E., M.D.	Brooklyn, New York
David R. Brown, S.B., S.M	Cloverdale, California
Otto A. Brusis, M.D., M.P.H.	Brookline, Mass.
Barbara H. Burr, A.B., M.D.	Boston, Mass.
Valentin P. Cassan, M.D.V.	Neuilly, France
Gennaro L. Cataldo, S.B., D.M.D.	Revere, Mass.
Peter T. Choras, B.SC., M.D.	Weston, Mass.
Robert M. Clapperton, M.D.	Zulia, Venezuela
Carlos E. Climent, M.D.	Cali, Colombia
Mary E. Coffey, S.B., S.M.	Cambridge, Mass.
Carol A. Cohen, S.B.	Brooklyn, New York
Joel E. Cohen, A.B., A.M., PH.D., M.P.H.	Washington, D.C.
Kahl-Martin Colimon, M.D., M.P.H.	Medellin, Colombia
*Roger R. Connelly, S.B., S.M. IN HYG.	Mason City, Iowa
Joyce E. Corey, A.B.	Sharon, Mass.
William R. Craig, A.B., A.M.	Sacramento, California
Jeffrey A. Cutler, A.B., M.D.	Framingham, Mass.
James E. Dalen, S.B., A.M., M.D.	Chestnut Hill, Mass.
Mark Degnan, S.B., M.D.	Middletown, New York
Richard K. Donelson, M.D., M.P.H.	Needham, Mass.
James E. Drorbaugh, A.B., M.D.	Brookline, Mass.

JoAnn I. Eckels, S.B., S.M.	Reading, Mass.
Bruce A. Egan, A.B., S.M.	Brookline, Mass.
Philip I. Elkin, A.B.	Scarsdale, New York
Connie J. Evashwick, A.B., A.M.	Long Beach, California
Esther H. Ewing, A.B.	Swampscott, Mass.
Joseph B. Fashakin, B.SC., S.M., S.M.	Akure, Nigeria
Jonathan E. Fielding, A.B., A.M., M.D.	Boston, Mass.
Katherine A. Finseth, A.B., M.D.	Watertown, Mass.
Sheldon A. Fishman, S.B., S.M.	Newton, Mass.
Daniel F. Flynn, A.B.	Waltham, Mass.
Jerold M. Frankel, A.B., D.M.D.	Atlanta, Ga.
Frank A. Franklin, Jr., A.B., M.D.	West Orange, New Jersey
Kathleen A. Gaffney, A.B., M.D.	Highland, New York
James M. Galvin, S.B., S.M., S.M.	Cincinnati, Ohio
Roger I. Glass, A.B.	Somerville, New Jersey
Judith D. Goldberg, A.B., S.M. IN HYG.	New York, New York
Michael D. Goldman, A.B., M.D., S.M. IN HYG.	Wayland, Mass.
*Donald E. Goldstone, A.B., M.D., M.P.H.	Baltimore, Maryland
*Peter Greenwald, A.B., M.D., M.P.H.	Albany, New York
Barbara N. Grossman, A.B., M.A.T., S.M. IN HYG.	Cambridge, Mass.
William Gurnack, A.B., M.D.	Columbia, Connecticut
*Jean-Pierre Habicht, M.D., M.P.H.	Geneva, Switzerland
William E. Halperin, A.B.	Loveladies, New Jersey
*Douglas I. Hammer, S.B., M.D., M.P.H.	South Orange, New Jersey
Laurel S. Harken, S.B., M.D.	Boston, Mass.
*Andrew C. Harper, M.B.,B.S., M.P.H.	New South Wales, Australia
Lisa M. Hartnagel, A.B.	Clyde, New York
*Stuart C. Hartz, B.B.A., S.M.	Boston, Mass.
Ann Hathaway, A.B.	Concord, New Hampshire
William C. Hinds, B.M.E., S.M. IN HYG.	Waterville, Maine
*Margaret B. Hoff, A.B., S.M.	Niagara Falls, New York
William H. Hollinshead, A.B., M.D.	St. Paul, Minnesota
Robert N. Hoover, A.B., M.D., S.M. IN HYG.	Boston, Mass.
Ronald J. Hurley, S.B.	Newburyport, Mass.
Aaron E. Ifekwunigwe, M.B.,B.S., M.D., D.T.M. & H.	Onitsha, Nigeria
Frank J. Jehle, Jr., A.B., M.D.	Lincoln Park, Michigan
Lawrence J. Jenkins, A.B.	Sikeston, Missouri
William M. Johnson, A.B., M.D., M.P.H.	Phoenix, Arizona
Paula H. Kanarek, S.B., S.M. IN HYG.	Oak Park, Michigan
Martin J. Kandes, S.B., M.P.H.	Daisytown, Pennsylvania

Michael L. Kaplan, S.B., D.V.M., S.M. IN HYG.	Marblehead, Mass.
Samuel D. Kaplan, A.B., M.D., S.M. IN HYG.	Port Jervis, New York
Joel Kavet, S.B., M.P.H.	Branford, Connecticut
Anne B. Keith, A.B.	Boston, Mass.
Ralph L. Kent, Jr., A.B., S.M. IN HYG.	Milton, Mass.
John C. Kepper, S.B., D.D.S.	Washington, D.C.
Howard S. King, A.B., M.D.	Newton, Mass.
Peter J. Knapp, S.B., S.M. IN HYG.	Arlington, Mass.
William C. Knowler, A.B.	Iowa City, Iowa
Cornelis A. Kolff, S.B.	Boston, Mass.
James P. Kornberg, S.B., S.M.	St. Louis, Missouri
John C. Leadbeater, S.B., M.D.	Denver, Colorado
John B. Levine, A.B.	Lowell, Mass.
Alan Leviton, A.B., M.D.	Brookline, Mass.
William V. Lipton, A.B., S.M.	Westfield, New Jersey
Stephen K. Lwanga, B.A., M.SC., S.M. IN HYG.	Kampala, Uganda
Robert D. Lynch, A.B., S.M. IN HYG.	Medford, Mass.
Joseph L. Lyon, S.B., M.D., M.P.H.	Salt Lake City, Utah
Alexander E. MacLeod, B.D.S., D.D.S., M.A.	Halifax, Nova Scotia
Anastasia Makris, A.B., S.M., S.M. IN HYG.	Bristol, Connecticut
Therese M. Malcolm, A.B., A.M.	Natick, Mass.
Theo C. Manschreck, A.B.	Chicago, Illinois
Wendy K. Marson, B.SC.N.	Ontario, Canada
Gladys E. Martin, M.B.,B.S.	Cameroon, West Africa
Arnold F. Mazur, A.B., M.D.	Salt Lake City, Utah
*Edward N. McIntosh, S.B., M.D., S.M. IN HYG.	David City, Nebraska
Alexander J. McLean, B.E., M.E., S.M. IN HYG.	Blackwood, Australia
*Phyllis B. Michelsen, A.B., S.M.	New Bedford, Mass.
*Augustine E. Moffitt, A.B., S.M. IN HYG.	Cincinnati, Ohio
Brian V. Mokler, A.B., S.M., S.M. IN HYG.	Belmont, Mass.
Lucien A. Moolenaar, D.D.S.	St. Thomas, Virgin Islands
German E. Mora, M.D., M.P.H.	Manizales, Colombia
Jose O. Mora, M.D., M.P.H.	Bogota, Colombia
Edilberto Morales, M.D.	Panama City, Panama
Jean E. Morehead, A.B., M.P.H.	Needham, Mass.
Gail I. Moreschi, A.B., M.D.	Winnetka, Illinois
Alan S. Morrison, A.B., M.D., S.M. IN HYG.	Brookline, Mass.
Elizabeth A. Murphy, A.B., M.P.H., S.M. IN HYG.	Larchmont, New York

Michael D. Murphy, M.B., B.CH.	Dublin, Ireland
Nirmala Murthy, B.A., A.M.	Bombay, India
Anthony C. Mustalish, A.B., M.D.	New York, New York
Kenneth K. Nakano, A.B., M.D.	Honolulu, Hawaii
Raymond K. Neff, A.B., S.M. IN HYG.	Manhasset, New York
Michael H. Nelson, L.R.C.P.	London, England
Joyce A. Nettleton, B.H.SC., M.N.S.	Ontario, Canada
*Raymond R. Neutra, A.B., M.D., M.P.H.	Los Angeles, California
Eli H. Newberger, A.B., M.D.	Boston, Mass.
Donald T. Oakley, S.B., S.M.	Wellesley, Mass.
Chong D. Park, M.D.	Pusan, Korea
Lawrence J. Partridge, Jr., S.B., S.M.	Pittsfield, Mass.
Robert M. Patterson, A.B., S.M. IN HYG.	Aiken, South Carolina
Susan Perrine, A.B.	Dhahran, Saudi Arabia
Rudolph W. Pierce, S.B., M.D.	Attleboro, Mass.
Eileen W. Prince, A.B., S.M. IN HYG.	Boston, Mass.
Ann S. Randtke, A.B.	Rochester, New York
Anthony E. Raynes, B.SC., M.B.,B.S.	London, England
Habib Redjeb, M.D.	Tunis, Tunisia
Keith S. Reisinger, A.B., M.D.	Pittsburgh, Pennsylanvia
Rudy J. Richardson, S.B., S.M.	Wichita, Kansas
*Jean A. Rochon, B.A., LL.L., M.D., M.P.H.	Montreal, Canada
John Rodak, A.B., S.M. IN HYG.	Marilla, New York
*Edward J. Rolde, A.B., M.D., S.M. IN HYG.	Weston, Mass.
Peter M. Roncetti, S.B. IN CIVIL ENG.	Teaticket, Mass.
Lynn A. Rosenberg, A.B., A.M.	Brookline, Mass.
Roger Rosenblatt, A.B.	Boston, Mass.
Kenneth J. Rothman, A.B., D.M.D., M.P.H.	Boston, Mass.
Stephen N. Rudnick, S.B., S.M., S.M. IN HYG.	Wethersfield, Connecticut
George M. Ryan, S.B., M.D.	Brookline, Mass.
Richard Ryan, Jr., A.B., M.S.S.S., S.M. IN HYG.	Boston, Mass.
Eleanor M. Santiago, M.D.	Makati, The Philippines
William B. Saxbe, A.B., M.D.	Mechanicsburg, Ohio
Norman B. Schell, A.B., M.D.	Jericho, New York
Leslie D. Schlessinger, A.B.	Chicago, Illinois
Rolf W. Schmauz, M.D.	Postfach, West Germany
Odile M. Seeley, B.SC.	London, England
Andrew L. Selig, A.B., M.S.W., S.M. IN HYG.	Denver, Colorado
Warren Sewall, S.B., M.D.	West Hartford, Connecticut
Eleanor G. Shore, A.B., M.D., M.P.H.	Needham, Mass.
Reinhard Sidor, A.B., S.M. IN HYG.	Newton, Mass.

Susan Singleton, A.B.	Wakefield, Mass.
Douglas G. Smith, A.B., S.M. IN HYG.	Lancaster, Pennsylvania
Philip G. Sullivan, A.B., M.D.	Milton, Mass.
Vincent Sullivan, S.B., M.D.	Hingham, Mass.
Florence Tadiar, M.D.	San Fernando, The Philippines
James M. Taylor, A.B., M.D.	San Francisco, California
Christopher C. Tennant, M.B.,B.S.	New South Wales, Australia
Margaret Terzaghi, S.B., A.M., S.M. IN HYG.	Winchester, Mass.
Gilles P. Theriault, B.A., M.D.	Quebec, Canada
Hugh H. Tilson, A.B., M.D., M.P.H.	Vancouver, Washington
Philip M. Torrance, II, A.B., M.D.	Galveston, Texas
Jose F. Trabal-Santos, S.B., M.D.	San Juan, Puerto Rico
Pamela A. Trueheart, A.B., S.M. IN HYG.	Pittsford, New York
Fernand W. Turcotte, B.A., M.D.	Montreal, Canada
Anthony F. Vuturo, A.B., M.D.	Louisville, Kentucky
Hayleon D. Weerasinghe, M.B.,B.S., D.P.H., PH.D.	Matara, Ceylon
Roland L. Weinsier, S.B., M.D.	Orlando, Florida
Noel S. Weiss, A.B., M.D., M.P.H.	Boston, Mass.
Chi-Pang Wen, B.M., M.P.H.	Taipei, Taiwan
Lawrence West, A.B., M.D.	Goshen, Indiana
Larry H. Westerfield, S.B., M.D.	Hartford, Kentucky
William H. Wiese, A.B., M.D.	Cambridge, Mass.
Jerry R. Williams, A.B., B.SC., M.SC.	Fort Worth, Texas
Ray C. Woodcock, A.B.	Harrisonville, Pennsylvania
Ronald Wyzga, A.B., S.M.	Cambridge, Mass.
Francisco J. Yepes, B.SC., M.D., M.P.H.	Bogota, Colombia

* In Absentia

Part-time Special Students, 1970–71

Arnold L. Abrams, A.B., M.D.	Lexington, Mass.
Teresita O. Bernabe-Isidro, M.D.	Quezon City, The Philippines
Pamela Cantor, S.B.	Boston, Mass.
Indira C. de Beausset, A.B.	Tegucigalpa, Honduras
Robin D. Orr, S.M.	Sydney, Australia
Gloria A. Rudisch, A.B., M.D., M.P.H.	Brookline, Mass.
Helena A. Trindade, B.SC.	Rio de Janeiro, Brazil

SUMMARY

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Canada	7
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Degrees

On June 11, 1970, the following degrees were conferred:

DOCTOR OF PUBLIC HEALTH

Philip Timothy Cole, A.B. (*Michigan State Univ.*) 1960, M.D. (*Univ. of Vermont*) 1965, M.P.H. (*Harvard Univ.*) 1967
Thesis: Epidemiology of Urinary Bladder Cancer
Special Field: Epidemiology

Amin K. Said, M.P.,B.CH. (*Cairo Univ.*) 1949, M.P.H. (*Alexandria Univ.*) 1960, D.P.H. (*ibid.*) 1963, S.M. (*Columbia Univ.*) 1966
Thesis: Protein Quality for Growth and for Maintenance and the Response of Rats to Intakes of Essential Amino Acids
Special Field: Nutrition

DOCTOR OF SCIENCE IN HYGIENE

Andrew George Braun, S.B. (*Mass. Instit. of Technology*) 1961, A.M. (Middlebury *Coll.*) 1961, S.M. IN HYG. (*Harvard Univ.*) 1965
Thesis: Experimental Investigation of the Mechanism of Ultraviolet Mutagenesis in Escherichia Coli
Special Field: Radiological Health

Helen Patricia Cleary, A.B. (*Regis Coll.*) 1941, M.P.H. (*Yale Univ.*) 1950
Thesis: The Effect of Values on Behavior in a Rehabilitation Setting
Special Field: Health Services Administration

Steven Donald Cohen, S.B. (*Mass. Coll. of Pharmacy*) 1965, S.M. (*ibid.*) 1967
Thesis: Organophosphate Inhibition of Carboxylesterases and Its Relationship to Malathion Potentiation
Special Field: Toxicology

Jacqueline Fabia, M.D. (*Faculty of Medicine, Lille, France*) 1944, S.M. IN HYG. (*Harvard Univ.*) 1966
Thesis: Down's Syndrome (Mongolism). A Study of 2421 Cases Born Alive to Massachusetts Residents 1950–1966
Special Field: Epidemiology

Robert Joseph Szot, A.B. (*Rutgers Univ.*) 1960, S.M. (*Long Island Univ.*) 1963
Thesis: Adrenocortical Response to Toxic Chemical Stress
Special Field: Toxicology

Joseph Kirby Wagoner, S.B. (*Coll. of St. Thomas*) 1957, S.M. (*Univ. of Minnesota*) 1960
Thesis: Radiation Therapy for Gynecological Disorders and Subsequent Leukemia, Uterine Sarcoma and Other Malignancies
Special Field: Biostatistics and Epidemiology

MASTER OF PUBLIC HEALTH

Samuel Olushola Adenle, M.B.,B.S. (*Univ. of London, England*) 1959
Abdul-Ruzak Al-Adwani, M.B.,B.S. (*Univ. of London, England*) 1958, M.R.C.P. (*Royal Coll. of Physicians, London*) 1964
Dag Alf Andreassen, B.S. (*Norwegian "Gymnasium" Coll.*) 1950, M.D. (*Univ. of Bergen*) 1957
William Earl Barry, S.B. (*U.S. Military Academy*) 1959, M.D. (*Medical Coll. of Georgia*) 1968
Louis Etienne Bernard, A.B. (*Laval Univ.*) 1958, M.D. (*ibid.*) 1964
Herschel Bornstein, S.B. (*Indiana Univ.*) 1949, M.D. (*ibid.*) 1952
Otto Anton Brusis, M.D. (*Univ. of Munich*) 1961
Forrest Wayne Calico, A.B. (*Univ. of Kentucky*) 1962, M.D. (*ibid.*) 1966
Joel Ephraim Cohen, A.B. (*Harvard Univ.*) 1965, A.M. (*ibid.*) 1967
Genevieve Cuzacq-Hall, D.D.S. (*Univ. of Montreal*) 1967
Richard Kenneth Donelson, M.D. (*Univ. of Southern California*) 1966
Laurence Stephen Farer, A.B. (*Cornell Univ.*) 1957, M.D. (*New York Univ.*) 1961
Leonard Edward Glass, A.B. (*Dartmouth Coll.*) 1964, M.D. (*Tufts Univ.*) 1968
Anne-Marie Gropen, D.M.D. (*Univ. of Wurzburg, Germany*) 1959
Lauro Storm Halstead, A.B. (*Haverford Coll.*) 1958, M.D. (*Univ. of Rochester*) 1963
George Edwin Hardy, Jr., A.B. (*Albion Coll.*) 1961, M.D. (*Cornell Univ.*) 1965
Glenn Elmer Haughie, A.B. (*Harvard Univ.*) 1961, M.D. (*ibid.*) 1965
Ralph Hale Henderson, A.B. (*Harvard Univ.*) 1959, M.D. (*ibid.*) 1963
Jane Susan Henkel, A.B. (*Barnard Coll.*) 1962, M.D. (*New Jersey Coll. of Medicine*) 1966
Robert A. Henry, M.B.,B.S. (*Univ. of Queensland*) 1961
Donald Roswell Hopkins, S.B. (*Morehouse Coll.*) 1962, M.D. (*Univ. of Chicago*) 1966
William M. Johnson, A.B. (*Stanford Univ.*) 1963, M.D. (*ibid.*) 1968
Charles David Knox, S.B. (*North Carolina Coll.*) 1963, D.D.S. (*Howard Univ.*) 1968
Bernard Emanuel Kreger, A.B. (*Harvard Univ.*) 1959, M.D. (*Western Reserve Univ.*) 1963
Paul E. Landry, B.A. (*Univ. of Montreal*) 1956, M.D. (*ibid.*) 1962, C.S.P.Q. (*ibid.*) 1968
Lillian Lau, M.B.,B.S. (*Univ. of Malaya*) 1960
Eun Sook Lee, M.D. (*Yonsei Univ.*) 1964, M.Sc. (*ibid.*) 1968
Barry Steven Levy, S.B. (*Tufts Univ.*) 1966
Lewis Mantel, A.B. (*Cornell Univ.*) 1961, M.D. (*Albert Einstein Coll.*) 1965
Stanley C. Marinoff, A.B. (*Univ. of Pennsylvania*) 1958, M.D. (*Chicago Medical School*) 1962
Robert S. Marnoy, A.B. (*Harvard Univ.*) 1950, M.D. (*Boston Univ.*) 1954

SCHOOL OF PUBLIC HEALTH

J. Dennis Mull, A.B. (*Harvard Univ.*) 1960, M.D. (*Medical Coll. of Virginia*) 1965

Scott H. Nelson, A.B. (*Yale Univ.*) 1962, M.D. (*Harvard Univ.*) 1966

David Dunston Nicholas, S.B. (*Manhattan Coll.*) 1958, M.D. (*Yale Univ.*) 1962

Andrew W. Nichols, A.B. (*Swarthmore Coll.*) 1959, M.D. (*Stanford Univ.*) 1964

Larry Earl Noble, A.B. (*Univ. of Oregon*) 1960, M.D. (*ibid.*) 1964

Samuel Ofosu-Amaah, B.Sc. (*London Univ.*) 1954, M.B.,CH.B. (*Univ. of Glasgow*) 1959, D.C.H. (*England*) 1962, M.R.C.P. (*Glasgow*) 1964

Kenneth Eugene Powell, A.B. (*Harvard Univ.*) 1963, M.D. (*Northwestern Univ.*) 1968

Carolyn Ann Price, M.D. (*Univ. of Tennessee*) 1965

Samuel Morse Putnam, A.B. (*Harvard Univ.*) 1960, M.D. (*ibid.*) 1964

Therese Morais Rochon, B.A. (*Coll. Marguerite-Bourgeoys*) 1957, M.D. (*Univ. of Montreal*) 1963

Kenneth Jay Rothman, A.B. (*Colgate Univ.*) 1966, D.M.D. (*Harvard Univ.*) 1969

Gloria Rudisch, A.B. (*Brooklyn Coll.*) 1946, M.D. (*New York Univ.*) 1949

William Atkinson Ruth, A.B. (*Yale Univ.*) 1966

Haruhiko Sakurai, M.D. (*Keio Univ., Japan*) 1959, DR. MED. SCI. (*ibid.*) 1965

Eleanor Gossard Shore, A.B. (*Radcliffe Coll.*) 1951, M.D. (*Harvard Univ.*) 1955

Gary F. Stein, A.B. (*Union College, N.Y.*) 1960, M.D. (*Columbia Univ.*) 1964

Harold W. Ward, Jr., A.B. (*Lehigh Univ.*) 1966

Philip G. Weiler, S.B. (*Loyola Univ. of the South*) 1962, M.D. (*Tulane Univ.*) 1965

John L. Williams, A.B. (*Univ. of California, Berkeley*) 1963, M.D. (*Wayne Medical School*) 1968

Fitzpatrick Wilson, S.B. (*City Coll. of New York*) 1953, M.D. (*State Univ. of New York, Downstate Medical Center*) 1957

Raymond E.P. Zimmerman, A.B. (*Hamilton Coll.*) 1959, M.D. (*Univ. of New York*) 1963

MASTER OF INDUSTRIAL HEALTH

Daner R. Reider, A.B. (*Franklin & Marshall Coll.*) 1963, M.D. (*Northwestern Univ.*) 1967

MASTER OF SCIENCE IN HYGIENE

(in the field of Air Pollution Control)

Robert Maurice Patterson, A.B. (*Univ. of the South*) 1968

Stephen Rudnick, S.B. (*Worcester Polytechnic Instit.*) 1965, S.M. (*Univ. of Penn.*) 1967

(in the field of Behavioral Sciences)

Linda Lue Donelson, S.B. (*Univ. of Colorado*) 1964, S.M. (*Univ. of California at Los Angeles*) 1966

William B. Donovan, A.B. (*Univ. of California, Berkeley*) 1958, M.D. (*Marquette Univ.*) 1962

Robert C. Marvit, S.B. (*Mass. Coll. of Pharmacy*) 1960, M.D. (*Tufts Univ.*) 1964
John Oluremi Ojetunde, B.SC. (*Univ. of Ibadan*) 1967
Andrew Lee Selig, A.B. (*Univ. of Colorado*) 1965, M.S.W. (*New York Univ.*) 1967

(in the field of Biostatistics)

Paul Francis DePaola, A.B. (*Harvard Univ.*) 1955, D.D.S. (*Temple Univ.*) 1960, M.D.S. (*Tufts Univ.*) 1965

(in the fields of Epidemiology)

Theresa Pei Chiang-Tze, B.SC. (*Dalhousie Univ.*) 1961, D.D.S. (*ibid.*) 1965
Robert Nolan Hoover, A.B. (*Univ. of Notre Dame*) 1964, M.D. (*Loyola Univ.*) 1968
Robert W. Morgan, M.D. (*Univ. of British Columbia*) 1961
Franz Pardo, M.D. (*Nat. Univ. of Colombia*) 1962, M.P.H. (*ibid.*) 1963
Anthony J. Radford, M.B.,B.S. (*Univ. of Adelaide*) 1960, D.T.M.&H. (*Univ. of Liverpool*) 1965, M.R.C.P. (*Edinburgh*) 1965, M.R.C.P. (*London*) 1965

(in the field of Epidemiology and Biostatistics)

Stephen K. Lwanga, B.A. (*London Univ.*) 1965, M.SC. (*Aberdeen Univ.*) 1967

(in the field of Health Services Administration)

Harold Bruce Dull, A.B. (*Harvard Univ.*) 1952, M.D. (*Western Reserve Univ.*) 1956
Marilyn Theresa Hansen, S.B. (*Coll. of St. Rose*) 1952, S.M. (*Siena Coll.*) 1960
Cynthia L. Parris, S.B. (*Northeastern Univ.*) 1953, ED.M. (*Boston Univ.*) 1968

(in the field of Maternal and Child Health)

R. Heather Palmer, B.A. (*Cambridge Univ., England*) 1960, M.B.,B.CH. (*ibid.*) 1963, M.A. (*ibid.*) 1964

(in the field of Microbiology)

Barbara Ann Seigal, S.B. (*Univ. of Wisconsin*) 1965

(in the field of Nutrition)

Bess I. Miller, A.B. (*Univ. of Chicago*) 1968
Arpi Ani Simonian, B.SC. (*American Univ. of Beirut*) 1961, M.S. (*ibid.*) 1963
Eduardo Tovar, M.D. (*University of Caracas*) 1959

(in the field of Population Sciences)

Jennifer Leaning Link, A.B. (*Radcliffe Coll.*) 1968
Siri Veronika Melchior, A.B. (*Radcliffe Coll.*) 1968
Ronald W. O'Conner, S.B. (*Yale Univ.*) 1961, M.D. (*Columbia Univ.*) 1966

SCHOOL OF PUBLIC HEALTH

(in the field of Radiobiology)

Richard W. Piontek, A.B. (*American International Coll.*) 1965, S.M. (*Rutgers Univ.*) 1969
Margaret Terzaghi, A.B. (*Boston Univ.*) 1964, A.M. (*ibid.*) 1969

(in the field of Radiological Health)

Peter James Knapp, S.B. (*Univ. of the South*) 1956
James A. MacDonald, S.B. (*Lowell Tech. Instit.*) 1968
Rosemarie Wipfelder, S.B. (*Mass. Instit. of Technology*) 1965

(in the field of Tropical Public Health)

Joseph Benford McCormick, S.B. (*Florida Southern Coll.*) 1964

On March 8, 1971 the following degrees were conferred:

DOCTOR OF SCIENCE IN PHYSIOLOGY

David R. Brown, S.B. (*Cornell Univ.*) 1958, S.M. (*Univ. of California, Berkeley*) 1967
Thesis: Factors Which Influence Organophosphate Induced Narcosis
Special Field: Toxicology

DOCTOR OF SCIENCE IN BIOSTATISTICS

Margaret B. Hoff, A.B. (*Univ. of Rochester*) 1949, S.M. (*Johns Hopkins Univ.*) 1959
Thesis: A Matching Criterion for Continuous Bivariate Distributions

MASTER OF PUBLIC HEALTH

Michael A. Blau, B.Sc. (*McGill Univ., Canada*) 1964, D.D.S. (*Ibid.*) 1969
Vincent P. Sullivan, S.B. (*Boston Coll.*) 1957, M.D. (*Georgetown Univ.*) 1961

Index

Officers of Administration, Instruction and Research

KEY TO MAP

HARVARD SCHOOL OF PUBLIC HEALTH

1. Rotch Building
   55 Shattuck Street
   - Administration
   - Behavioral Sciences
   - Health Services Administration
   - Maternal and Child Health

2. Health Sciences Laboratories
   665 Huntington Avenue
   - Biostatistics
   - Epidemiology
   - Kresge Center for Environmental Health (Environmental Health Sciences and Physiology)
   - Microbiology
   - Nutrition
   - Population Sciences
   - Tropical Public Health

3. EDUCATIONAL FACILITIES BUILDING (in construction)

4. Henry Lee Shattuck International House
   199–203–207 Park Drive

HARVARD MEDICAL SCHOOL

5. Medical School Quadrangle
   25 Shattuck Street

5A. Building A — Administration

6. Vanderbilt Hall
   (Medical Area Health Services)
   109 Avenue Louis Pasteur

7. HARVARD SCHOOL OF DENTAL MEDICINE
   188 Longwood Avenue

8. FRANCIS A. COUNTWAY LIBRARY OF MEDICINE
   10 Shattuck Street

9. PETER BENT BRIGHAM HOSPITAL

10. MASSACHUSETTS MENTAL HEALTH CENTER

11. CHILDREN'S CANCER RESEARCH CENTER

12. CHILDREN'S HOSPITAL MEDICAL CENTER

13. SHIELDS WARREN RADIATION LABORATORY

14. NEW ENGLAND DEACONESS HOSPITAL

15. BETH ISRAEL HOSPITAL

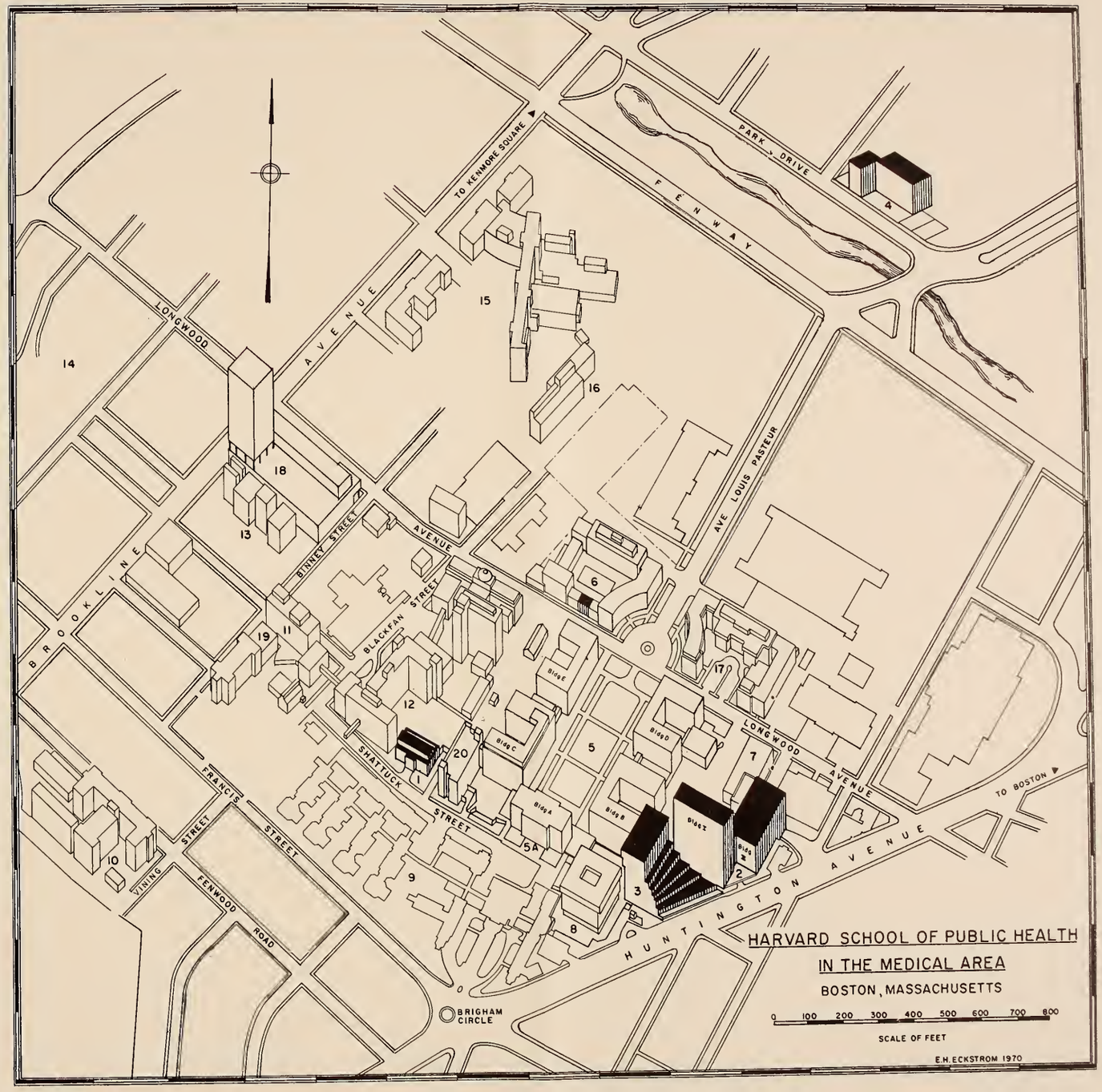
16. JUDGE BAKER GUIDANCE CENTER

17. BOSTON HOSPITAL FOR WOMEN (LYING-IN DIVISION)

18. MEDICAL AREA COOP

19. JIMMY FUND AUDITORIUM

20. LABORATORY FOR HUMAN REPRODUCTION AND REPRODUCTIVE BIOLOGY



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